SHARP SERVICE MANUAL

S6721AEXM24HRT

MULTI SPLIT TYPE ROOM AIR CONDITIONERS

OUTDOOR UNIT

MODELS AE-XM24HR

In the interests of user-safety (Required by safety regulations in some countries) the set should be restored to its original condition and only parts identical to those specified should be used.

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Parts Guide

Parts marked with " ⚠ " are important for maintaining the safety of the set. Be sure to replace these parts with specified ones for maintaining the safety and performance of the set.

SHARP CORPORATION

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The contents are subject to change without notice.

CHAPTER 1. SPECIFICATION

[1] SPECIFICATION

ITEMS	MODEL		INDOOR UNIT AY-XPM7FR/9FR/ X12FR	OUTDOOR UNIT AE-XM24HR
Cooling capacity	kW			
4-INDOOR OPERTION	7K&7K&7K&7K		7.0(3.0–8.2)*	
Heating capacity	kW			
4-INDOOR OPERTION	7K&7K&7K&7K		8.0(3.0–9.2)*	
Moisture removal (at cooling)☆	Liters/h		1.0X2&0.8*	
Electrical data				
Phase			Single	
Rated frequency	Hz		50	
Rated voltage	V		230V	
Rated current	Cool	A	10.0(2.7– 13.6)*	
	Heat	A	9.2(2.6 – 11.7)*	
Rated input ☆ (Min. - Max.)	Cool	W	2180 (600– 2980)*	
	Heat	W	2000 (560 – 2560)*	
Power factor ☆	Cool	%	95	
	Heat	%	95	
Compressor	Type		Hermetically sealed DC twin rotary	
	Model		DA150A1F-20F	
	Oil charge		Ester oil VG74	
Refrigerant system	Evaporator		Slit Fin and Grooved tube type	
	Condenser		Corrugate Fin and Grooved tube type	
	Control		Expansion valve	
	Name of refrirerant		R410A	
	Refrigerant volume		2300g	
Noise level (at cooling)	dB(A) Hi/Low/Soft		High/Med/Low	
			7FR:37/34/28	49
			9FR:39/36/28	
			12FR:40/37/29	
Fan system				
Drive			Direct drive	
Air flow quantity (at cooling)	. m^3/min.		Hight/Med/Low	
			7FR :8.0/7.4/5.4	43
			9FR :8.6/7.9/5.6	
			12FR :9.8/8.5/6.9	
Fan			Cross flow fan	Propeller fan
Connections				
Refrigerant coupling			Flare type	
Refrigerant tube size Gas, Liquid			3/8”,1/4”	
Maximum length (per unit)	m		20	
Maximum length(total)	m		50	
Maximum chargeless length	m		40	
Maximum height difference	m		10	
Drain joint	mm		O.Dϕ18	
Others				
Safety device	Compressor: Thermistor			
	Fan motors: Thermal fuse(indoor unit).			
	Thermal protecor(Out door unit)			
	Fuse, Micro computer control			
			Anti-mold polypropyene net of injection type (Wasshable)	
Net dimensions	Width	mm	790	940
	Heigh	mm	278	800
	Depth	mm	198	357
Net weight		kg	10	64

NOTE: The condition of star "☆" marked item are ‘ISO5151’: * : Representative connection

[2] EXTERNAL DIMENSION

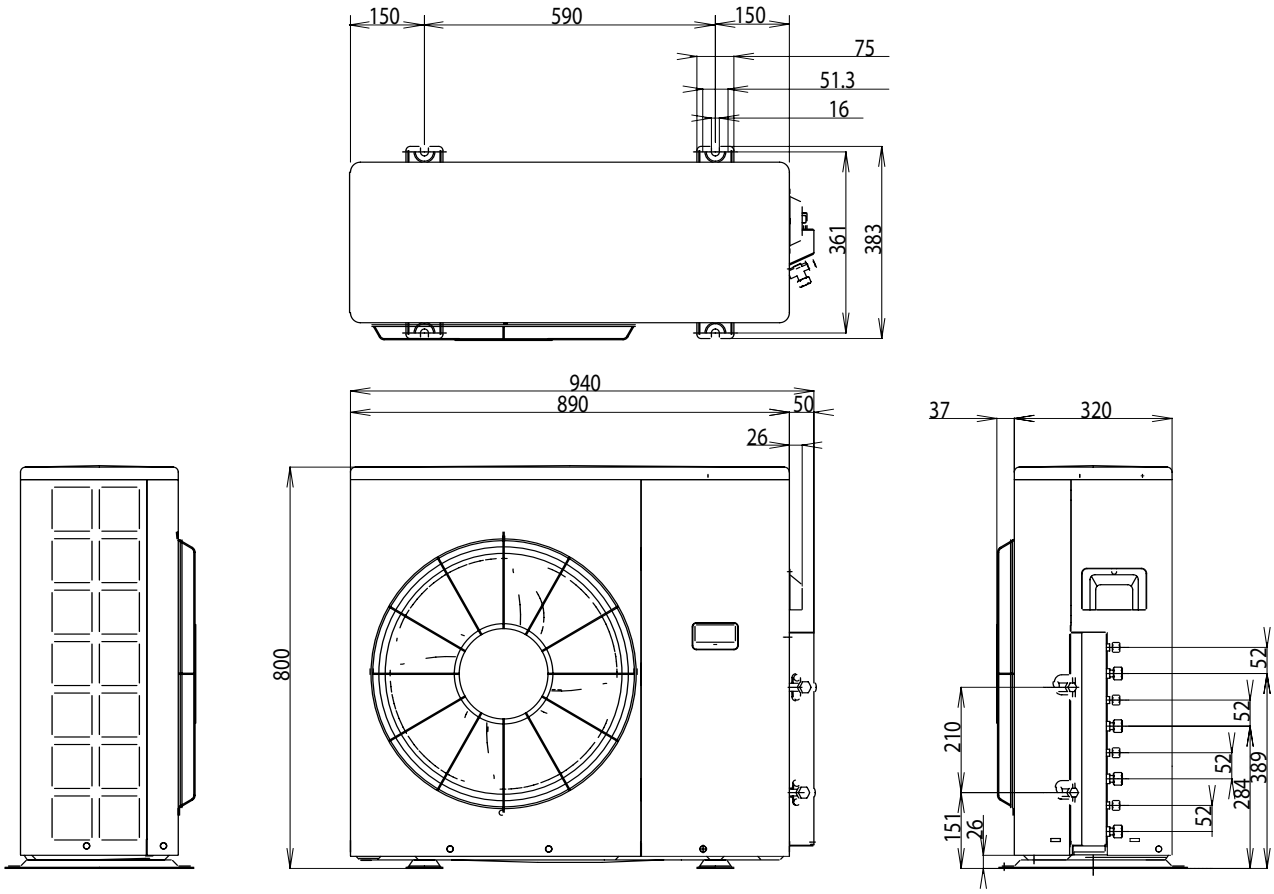


Figure OUTDOOR UNIT

[3] CAPACITY TABLE

1. Recommended Combination

Outdoor Units	Indoor Units			
	7:AY-XPM7FR,GS-XPM7FR 9:AY-XPM9FR,GS-XPM9FR,GS-XPM9FGR 12:AY-XPM12FR,GS-XPM12FR,GS-XPM12FGR			
AE-XM24HR	9	9	9	9
	12	9	7	7
	9	9	9	7
	12	7	7	7
	9	9	7	7
	9	7	7	7
	7	7	7	7

2. COOLING CAPACITY TABLE

Operating Status	Combination of Indoor Units				Cooling Capacity (kW)					Running Current (A)	Power Consumption (W)
	A	B	C	D	A	B	C	D	RATING (Min.-Max.)	RATING (Min.-Max.)	RATING (Min.-Max.)
4-Room	09	09	09	09	1.75	1.75	1.75	1.75	7.0 (3.0-8.2)	10.0 (2.7-13.6)	2180 (600-2980)
	12	09	07	07	2.40	1.80	1.40	1.40	7.0 (3.0-8.2)	10.0 (2.7-13.6)	2180 (600-2980)
	09	09	09	07	1.85	1.85	1.85	1.44	7.0 (3.0-8.2)	10.0 (2.7-13.6)	2180 (600-2980)
	12	07	07	07	2.55	1.48	1.48	1.48	7.0 (3.0-8.2)	10.0 (2.7-13.6)	2180 (600-2980)
	09	09	07	07	1.97	1.97	1.53	1.53	7.0 (3.0-8.2)	10.0 (2.7-13.6)	2180 (600-2980)
	09	07	07	07	2.10	1.63	1.63	1.63	7.0 (3.0-8.2)	10.0 (2.7-13.6)	2180 (600-2980)
	07	07	07	07	1.75	1.75	1.75	1.75	7.0 (3.0-8.2)	10.0 (2.7-13.6)	2180 (600-2980)
3-Room	09	09	09	OFF	2.27	2.27	2.27	OFF	6.8 (2.7-7.4)	10.1 (2.4-13.3)	2200 (530-2900)
	12	09	07	OFF	2.91	2.19	1.70	OFF	6.8 (2.7-7.4)	10.1 (2.4-13.3)	2200 (530-2900)
	12	07	07	OFF	3.14	1.83	1.83	OFF	6.8 (2.7-7.4)	10.1 (2.4-13.3)	2200 (530-2900)
	09	09	07	OFF	2.45	2.45	1.90	OFF	6.8 (2.7-7.4)	10.1 (2.4-13.3)	2200 (530-2900)
	09	07	07	OFF	2.50	1.95	1.95	OFF	6.8 (2.7-7.4)	9.2 (2.4-13.3)	2200 (530-2900)
	07	07	07	OFF	1.97	1.97	1.97	OFF	5.9 (2.7-7.3)	8.0 (2.4-12.6)	1750 (530-2760)
2-Room	12	09	OFF	OFF	3.20	2.40	OFF	OFF	5.6 (2.0-6.8)	8.3 (2.0-12.4)	1820 (430-2700)
	12	07	OFF	OFF	3.35	1.95	OFF	OFF	5.3 (2.0-6.7)	7.3 (2.0-12.0)	1590 (430-2630)
	09	09	OFF	OFF	2.50	2.50	OFF	OFF	5.0 (2.0-6.3)	6.4 (2.0-11.0)	1400 (430-2400)
	09	07	OFF	OFF	2.59	2.01	OFF	OFF	4.6 (2.6-5.9)	5.6 (2.0-9.2)	1230 (430-2000)
	07	07	OFF	OFF	2.00	2.00	OFF	OFF	4.0 (2.6-5.3)	4.8 (2.0-7.8)	1040 (430-1700)
1-Room	12	OFF	OFF	OFF	3.4	OFF	OFF	OFF	3.4 (1.6-4.0)	4.1 (1.8-6.0)	900 (400-1320)
	09	OFF	OFF	OFF	2.6	OFF	OFF	OFF	2.6 (16-3.3)	3.0 (1.8-4.3)	650 (400-930)
	07	OFF	OFF	OFF	2.0	OFF	OFF	OFF	2.0 (1.6-2.7)	2.3 (1.8-3.2)	500 (400-700)

3. HEATING CAPACITY TABLE

Operating Status	Combination of Indoor Units				Heating Capacity (kW)					Running Current (A)	Power Consumption (W)
	A	B	C	D	A	B	C	D	RATING (Min.-Max.)	RATING (Min.-Max.)	RATING (Min.-Max.)
4-Room	09	09	09	09	2.00	2.00	2.00	2.00	8.0 (3.0-9.2)	9.2 (2.6-11.7)	2000 (560-2560)
	12	09	07	07	2.74	2.06	1.60	1.60	8.0 (3.0-9.2)	9.2 (2.6-11.7)	2000 (560-2560)
	09	09	09	07	2.12	2.12	2.12	1.65	8.0 (3.0-9.2)	9.2 (2.6-11.7)	2000 (560-2560)
	12	07	07	07	2.91	1.70	1.70	1.70	8.0 (3.0-9.2)	9.2 (2.6-11.7)	2000 (560-2560)
	09	09	07	07	2.25	2.25	1.75	1.75	8.0 (3.0-9.2)	9.2 (2.6-11.7)	2000 (560-2560)
	09	07	07	07	2.40	1.87	1.87	1.87	8.0 (3.0-9.2)	9.2 (2.6-11.7)	2000 (560-2560)
	07	07	07	07	2.00	2.00	2.00	2.00	8.0 (3.0-9.2)	9.2 (2.6-11.7)	2000 (560-2560)
3-Room	09	09	09	OFF	2.6	2.6	2.6	OFF	7.8 (2.4-8.8)	11.4 (2.4-12.1)	2500 (520-2650)
	12	09	07	OFF	3.3	2.5	2.0	OFF	7.8 (2.4-8.8)	11.4 (2.4-12.1)	2500 (520-2650)
	12	07	07	OFF	3.6	2.1	2.1	OFF	7.8 (2.4-8.8)	11.4 (2.4-12.1)	2500 (520-2650)
	09	09	07	OFF	2.8	2.8	2.2	OFF	7.8 (2.4-8.8)	11.4 (2.4-12.1)	2500 (520-2650)
	09	07	07	OFF	3.1	2.4	2.4	OFF	7.8 (2.4-8.8)	11.4 (2.4-12.1)	2500 (520-2650)
	07	07	07	OFF	2.4	2.4	2.4	OFF	7.1 (2.4-8.8)	10.0 (2.4-12.1)	2180 (520-2650)
2-Room	12	09	OFF	OFF	4.2	3.1	OFF	OFF	7.3 (1.8-7.5)	11.0 (2.1-11.9)	2400 (450-2600)
	12	07	OFF	OFF	4.5	2.6	OFF	OFF	7.1 (1.8-7.5)	10.9 (2.1-11.9)	2380 (450-2600)
	09	09	OFF	OFF	3.2	3.2	OFF	OFF	6.4 (1.8-7.5)	9.4 (2.1-11.9)	2050 (450-2600)
	09	07	OFF	OFF	3.4	2.7	OFF	OFF	6.1 (1.8-7.5)	8.7 (2.1-11.9)	1900 (450-2600)
	07	07	OFF	OFF	2.7	2.7	OFF	OFF	5.3 (1.8-7.3)	7.2 (2.1-10.5)	1580 (450-2300)
1-Room	12	OFF	OFF	OFF	3.8	OFF	OFF	OFF	3.8 (1.1-5.2)	8.0 (1.8-11.0)	1750 (400-2400)
	09	OFF	OFF	OFF	2.9	OFF	OFF	OFF	2.9 (1.1-4.0)	5.2 (1.8-9.4)	1130 (400-2050)
	07	OFF	OFF	OFF	2.4	OFF	OFF	OFF	2.4 (1.1-3.4)	3.7 (1.8-6.6)	800 (400-1450)

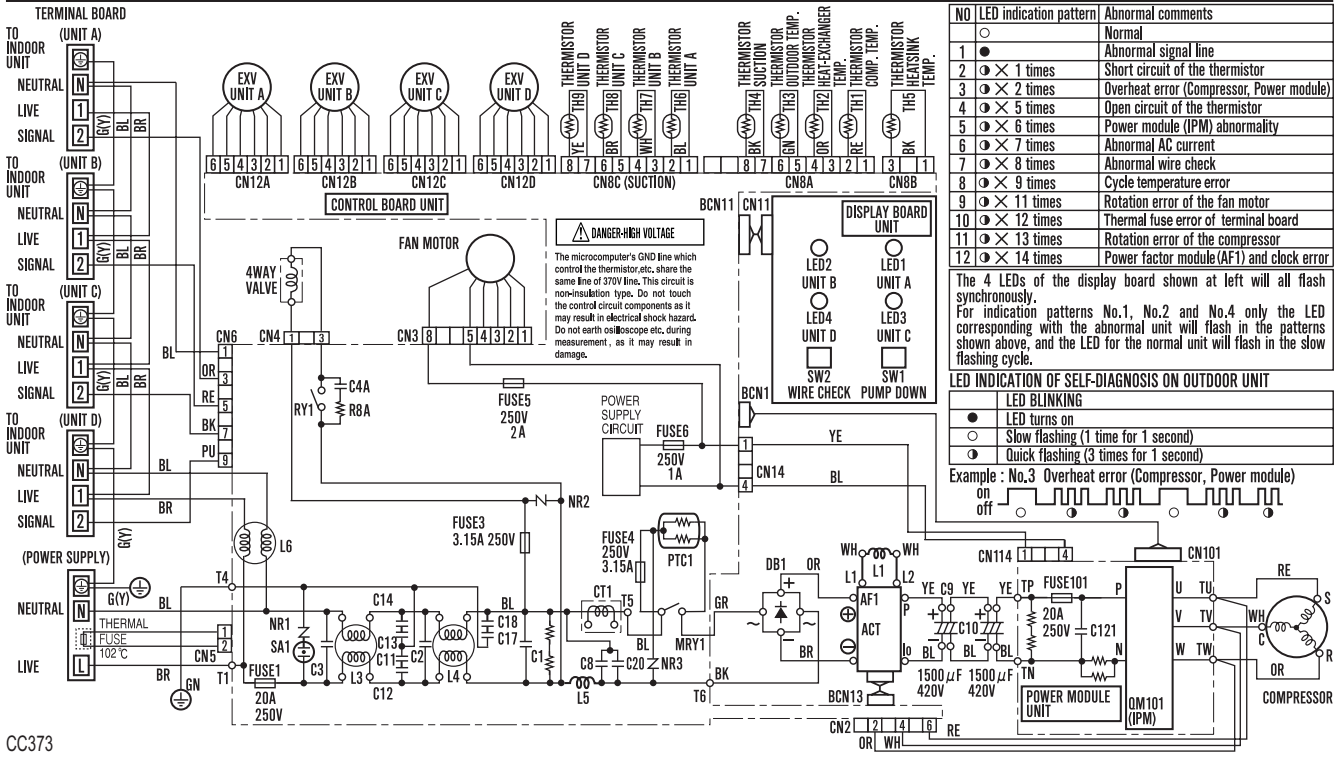
[4] ELECTRICAL PARTS

Compressor	DA220A2F-20L	Hermetically sealed DC twin rotary
Fuse 1,101	—	QFS-GA065JBZZ(20A,250V)
Fuse 3,4	—	QFS-GA062JBZZ(3.15A,250V)
Fuse 5	—	QFS-GA063JBZZ(2A,250V)
Fuse 6	—	QFS-GA064JBZZ(1A,250V)

[5] WIRING DIAGRAMS

1. FOR MODEL AEXM24HR

WIRING DIAGRAM


OUTDOOR UNIT
CAUTION The voltage is high at C9, C10 (electrolytic capacitors) on outdoor unit. For maintenance discharge at C9, C10 to prevent electric shock. in case that FUSE101 (protector) has been fused, the voltage is kept high at C9, C10.
BK: BLACK GR : GRAY OR : ORANGE GN: GREEN
BL: BLUE RE : RED G(Y): GREEN/YELLOW PU : PURPLE
BR: BROWN WH : WHITE YE : YELLOW
TERMINAL BOARD
TO INDOOR UNIT (UNIT A)
TO INDOOR UNIT (UNIT B)
TO INDOOR UNIT (UNIT C)
TO INDOOR UNIT (UNIT D)
NEUTRAL
LIVE
SIGNAL
(POWER SUPPLY)
EXV UNIT A
EXV UNIT B
EXV UNIT C
EXV UNIT D
THERMISTOR UNIT D
THERMISTOR UNIT C
THERMISTOR UNIT B
THERMISTOR UNIT A
THERMISTOR SUCTION
THERMISTOR OUTDOOR TEMP.
THERMISTOR HEAT-EXCHANGER TEMP.
THERMISTOR COMP. TEMP.
THERMISTOR HEATSINK TEMP.
CN12A
CN12B
CN12C
CN12D
CN8C (SUCTION)
CN8A
CN8B
CONTROL BOARD UNIT
DANGER-HIGH VOLTAGE
The microcomputer's GND line which control the thermistor,etc. share the same line of 370V line. This circuit is non-insulation type. Do not touch the control circuit components as it may result in electrical shock hazard. Do not earth oscilloscope etc. during measurement , as it may result in damage.
FAN MOTOR
4WAY VALVE
DISPLAY BOARD UNIT
LED2 UNIT B
LED1 UNIT A
LED4 UNIT D
LED3 UNIT C
SW2 WIRE CHECK
SW1 PUMP DOWN
POWER SUPPLY CIRCUIT
FUSE5 250V 2A
FUSE6 250V 1A
FUSE3 3.15A 250V
FUSE4 250V 3.15A
PTC1
THERMAL FUSE 102°C
FUSE1 20A 250V
FUSE101 20A 250V
POWER MODULE UNIT
QM101 (IPM)
COMPRESSOR
CC373

NO	LED indication pattern	Abnormal comments
	○	Normal
1	●	Abnormal signal line
2	◑ × 1 times	Short circuit of the thermistor
3	◑ × 2 times	Overheat error (Compressor, Power module)
4	◑ × 5 times	Open circuit of the thermistor
5	◑ × 6 times	Power module (IPM) abnormality
6	◑ × 7 times	Abnormal AC current
7	◑ × 8 times	Abnormal wire check
8	◑ × 9 times	Cycle temperature error
9	◑ × 11 times	Rotation error of the fan motor
10	◑ × 12 times	Thermal fuse error of terminal board
11	◑ × 13 times	Rotation error of the compressor
12	◑ × 14 times	Power factor module (AF1) and clock error

The 4 LEDs of the display board shown at left will all flash synchronously.
For indication patterns No.1, No.2 and No.4 only the LED corresponding with the abnormal unit will flash in the patterns shown above, and the LED for the normal unit will flash in the slow flashing cycle.

LED INDICATION OF SELF-DIAGNOSIS ON OUTDOOR UNIT

	LED BLINKING
●	LED turns on
○	Slow flashing (1 time for 1 second)
◑	Quick flashing (3 times for 1 second)

Example : No.3 Overheat error (Compressor, Power module)

2. PRINTED WIRING BOARD

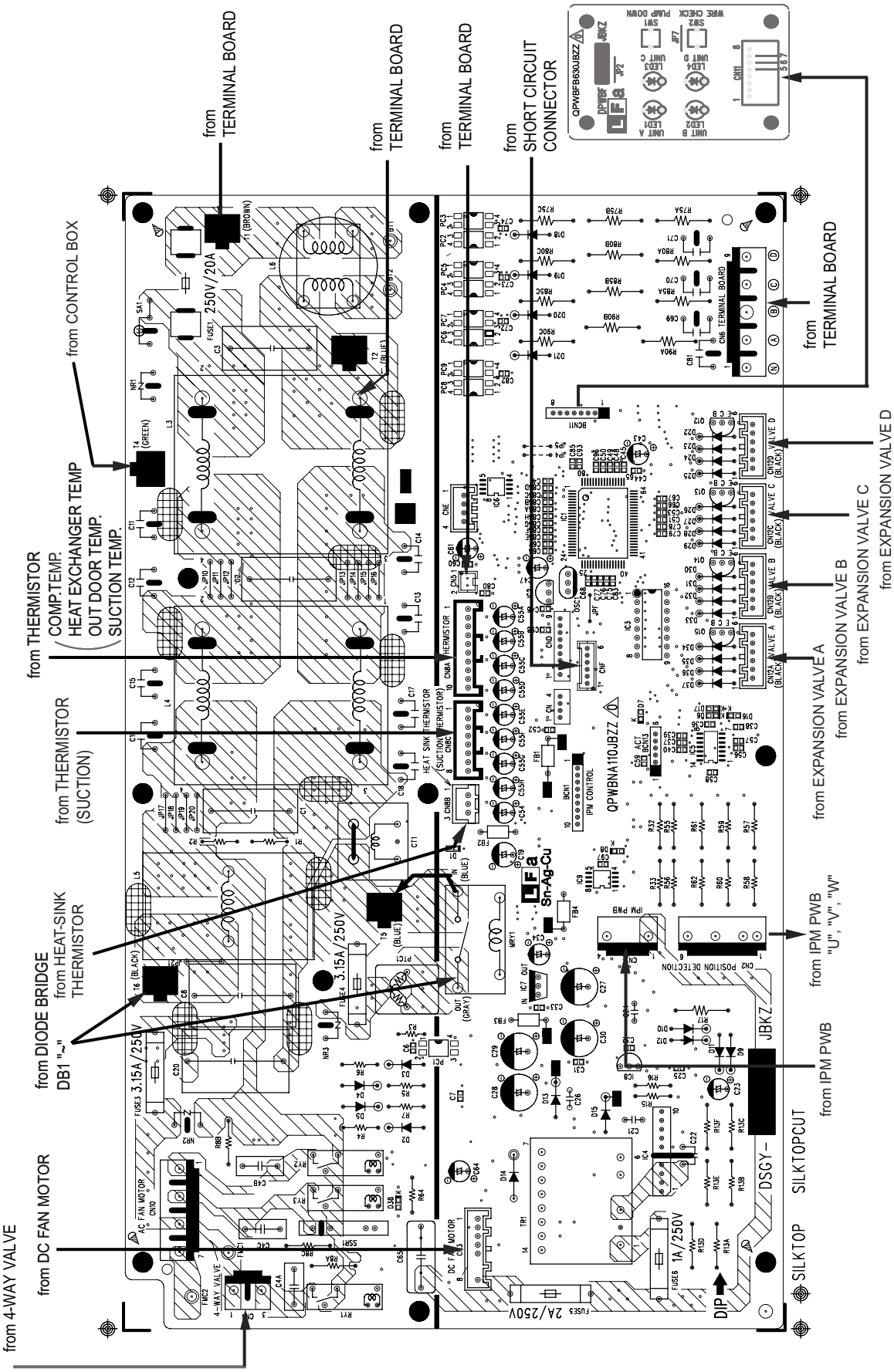


Figure CONTROL P.W.B and DISPLAY P.W.B

3. PRINTED WIRING BOARD

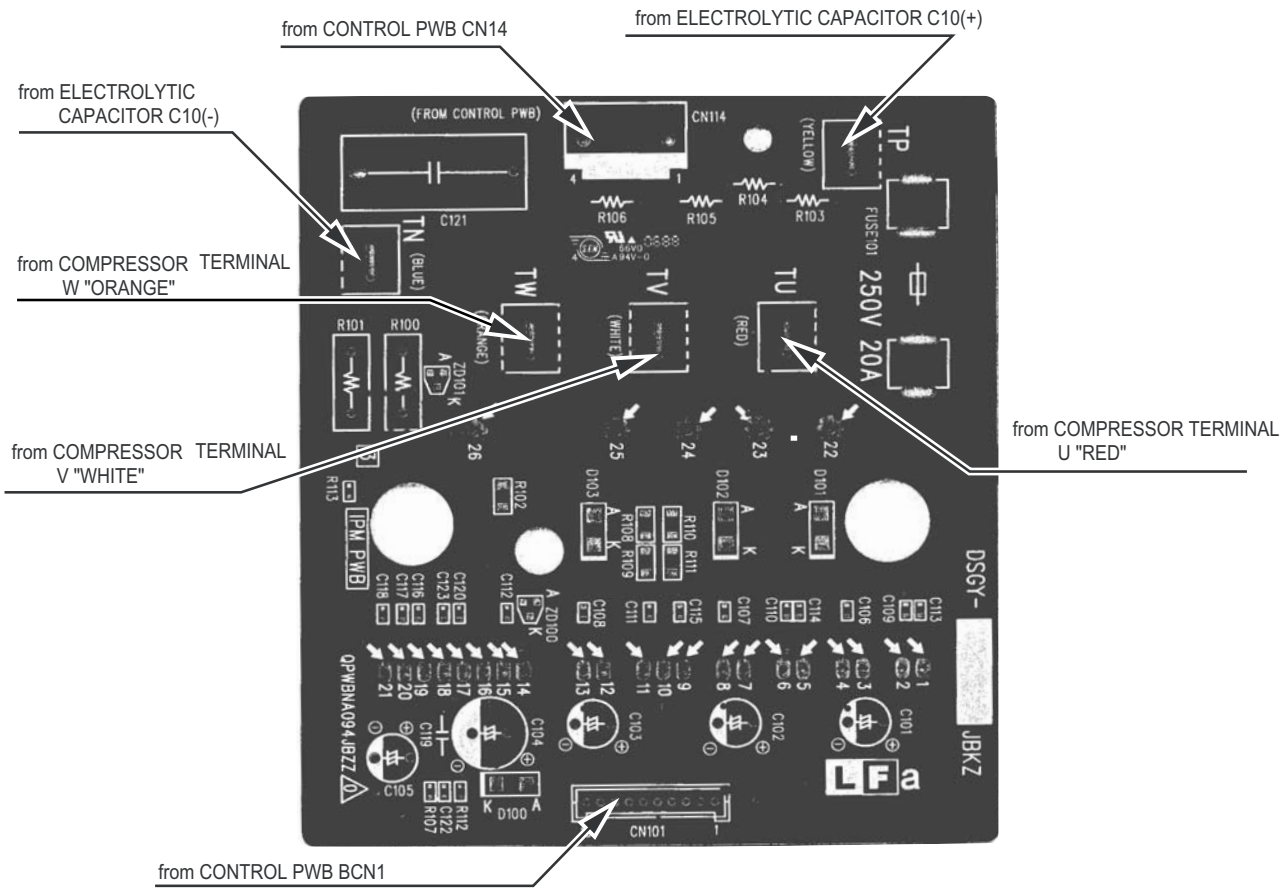
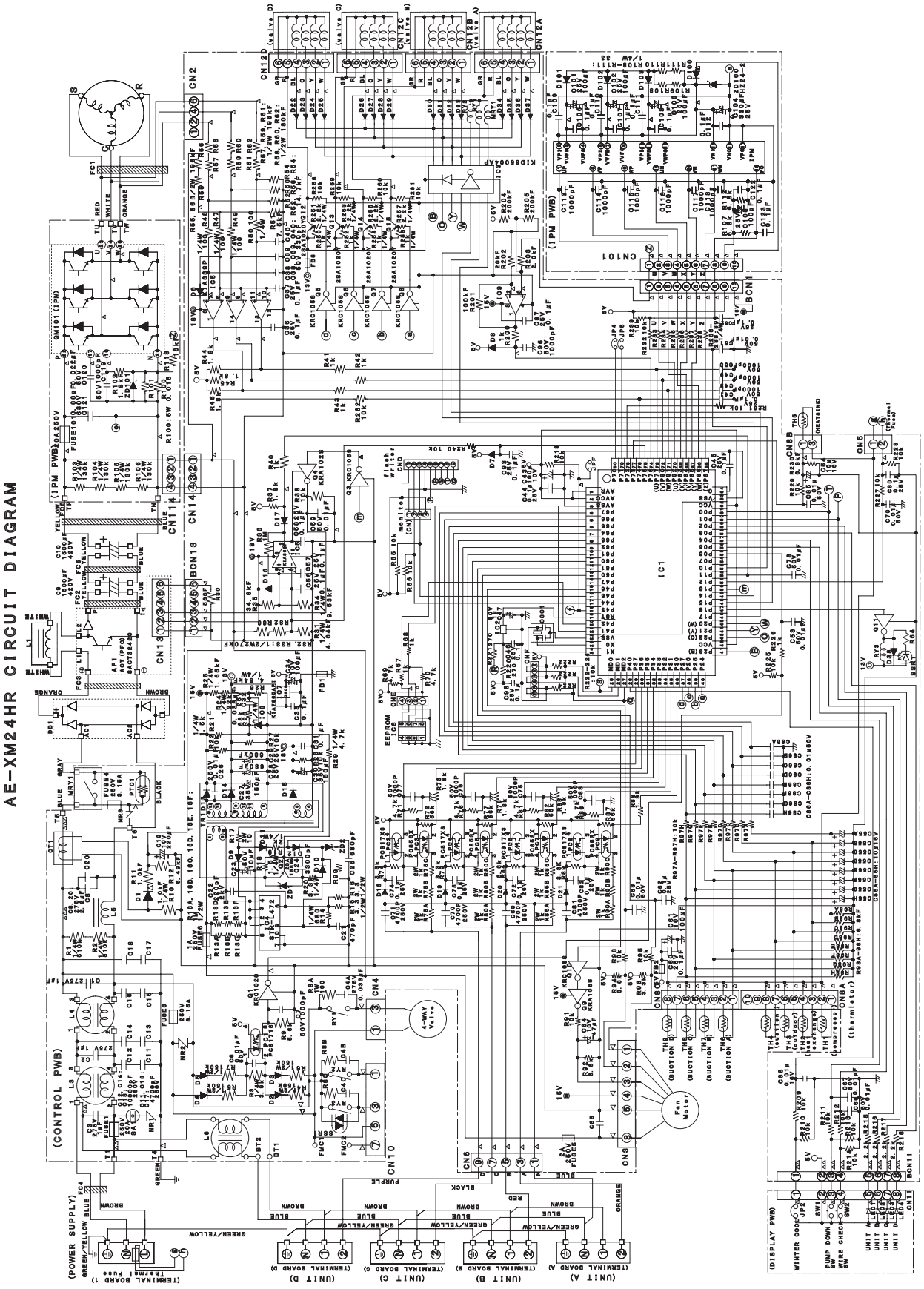


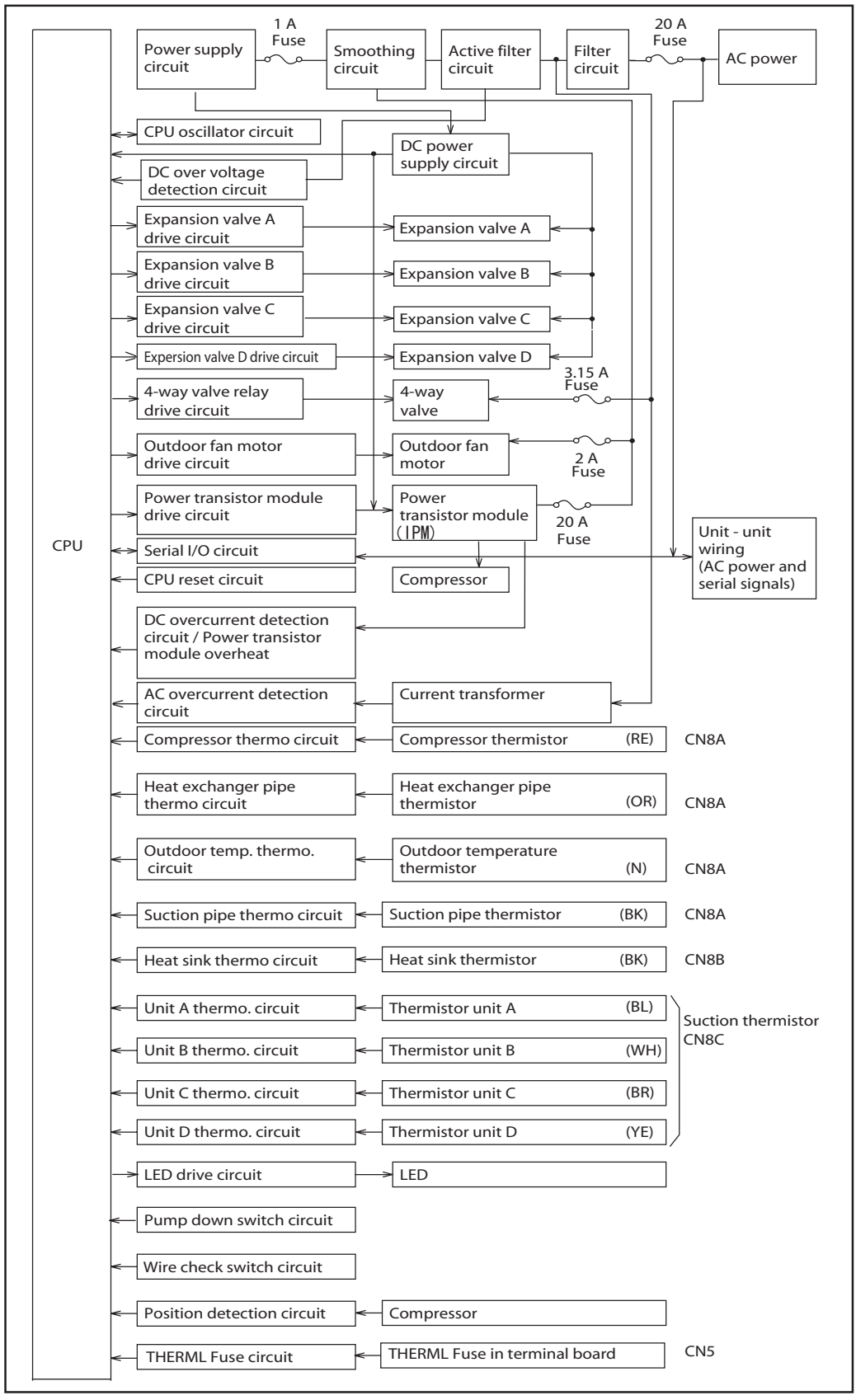
figure IPM P.W.B

4. ELECTRONIC CONTROL CIRCUIT DIAGRAM



CHAPTER 2. EXPLANATION OF CIRCUIT AND OPERATION

[1] BLOCK DIAGARM



[2] FUNCTION

1. OUTDOOR UNIT

1.1. FREQUENCY CONTROL

(1) AC current peak control

	Cooling mode	Heating mode
AE-XM24HR	16.5A	16.5A

(2) Prevention control of outdoor heat exchanger overheating

If the temperature of the outdoor heat exchanger exceeds the over heating prevention line 1or 2 during cooling, the operating frequency is lowered by approximately 5 to 15Hz.

After that, the frequency is lowered approximately 5Hz once every 60 seconds or approximately 15Hz once every 120 seconds.

When the temperature of the outdoor heat exchanger goes below the overheating prevention clear line, the frequency is raised by approximately 5Hz once every 60 seconds, and normal operation is restored.

If the frequency is lowered to minimum frequency without the temperature of the outdoor heat exchanger decreasing and this condition lasts for 1 minute, the compressor will be stopped.

Overheating Prevention line 1	**55°C**	**Lower 5Hz once every 60 seconds**
Overheating Prevention line 2	57°C	Lower 15Hz once every 120 seconds
Overheating Prevention clearline	54°C	

(3) Prevention control of compressor overheating If the temperature of the compressor exceeds approximately 108°C the operating frequency is lowered approximately 5Hz.

After that, the frequency is lowered approximately 5Hz once every 60 seconds.

When the compressor temperature drops below approximately 108°c, the frequency is raised approximately 5Hz once every 60 seconds, and normal operation is restored.

If the frequency is lowered to minimum frequency without the temperature of the compressor decreasing,and this condition lasts for 1 minute, the compressor will be stopped.

(4) Prevention control of indoor heat exchanger overheating

Two minutes after room several decrease If the temperature of any of indoor heat exchangers exceeds the overheating prevention line 1 or 2 during heating, the operating frequency is lowered to minimum frequency.

When the temperature of all of indoor heat exchangers go below the overheating prevention line 1, the frequency is raised by approximately 5Hz once every 60 seconds, and normal operation is restored.

If the condition that the frequency is minimum lasts for 2 minutes, the compressor will be stopped.

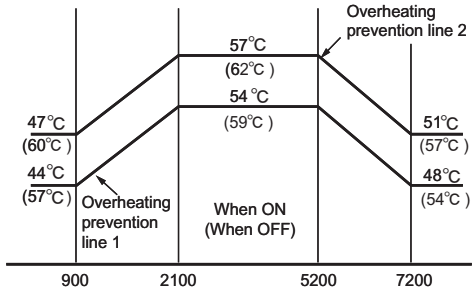
<when nomal>

if the temperature of any of indoor heat exchangers exceeds the overheating prevention line 1 or 2 during heating, the operating frequency is lowered by approximately 5 to 15Hz.

After that , the frequency is lowered approximately 5Hz once every 60 seconds or approximately 15Hz once every 90 seconds.

When the temperature of all of indoor heat exchangers go below the overheating prevention line 1, the frequency is raised by approximately 5Hz once every 60 seconds, and normal operation is restored.

If the condition that the frequency is minimum lasts for 2 minutes, the compressor will be stopped.



1.2. OVER CURRENT PROTECTION

DC over current detection, AC over current detection

To protect against over current due to sudden change in load,the compressor is stopped if 55A DC is exceeded in the DC section.

If the set value of AC current is exceeded in the AC section, the compressor is stopped. 90 seconds after the compressor has been stopped, another starting try will be made.

Three retries are allowed. On the fourth retry, a complete stop request signal is sent to the indoor unit, and the outdoor unit will remain stopped until the indoor operation is stopped.

DC over current is detected by the power module.

AC over current is detected by CT1 on the outdoor PWB.

	Cooling mode	Heating mode
AE-XM24HR	19.3A	19.3A

1.3. COMPRESSOR PROTECTION CONTROL

If the temperature of the compressor exceeds 113°C the compressor is stopped.

In this case, the outdoor fan is not stopped until the temperature of compressor drops below 99°C.In 90 seconds after the compressor is stopped, if the temperature is below 90°C another starting try will be made. Three retries are allowed.

On the fourth retry, a complete stop request signal is sent to the indoor unit, and the outdoor unit will remain stopped until the indoor operation is stopped.

1.4. POWER TRANSISTOR MODULE PROTECTION

If the temperature of the chips in the power transistor module exceeds 100°C,the compressor is stopped.

In this case, the outdoor fan is not stopped until the temperature of power module drops below 85°C. In 90 seconds after the

compressor is stopped, if the temperature is below 85°C,another starting try will be made. Three retries are allowed. On the fourth retry, a complete stop request signal is sent to the indoor unit, and the outdoor unit will remain stopped until the indoor operation is stopped.

1.5. SERIAL SIGNALS

Serial signals consist of all 96-bit signals.

If the condition as outdoor unit unable to receive a serial signal from the indoor unit continues for 30 seconds, it closes the expansion valve which corresponds to the room which can not be communicated.

If all indoor units can not communicate with the outdoor unit, the compressor is stopped.

1.6. THERMISTOR OPEN OR SHORT

When compressor, heat exchanger, outdoor thermistor, suction thermistor (CN8A) are in OPEN or SHORT condition,even if they are in the condition which an operation signal is transmitted from indoors, the compressor will not start. If any suction thermistors (CN8C) become OPEN or SHORT resistance, the protective procedure will work only for the cycle corresponding to the malfunctioning suction thermistor.

1.7. MISWIRING CHECK

"Miswiring check" is conducted by detecting the indoor heat exchanger indoor heat exchanger temp.

For example, when the expansion valve for only room A is open, and the wiring is correct, the indoor heat exchanger temp for room A will reduce.

If the wiring is incorrect, the indoor heat exchanger temp for a different room will reduce.

1.8. SAFETY TIME

When the unit is operated by the remote control after the breaker is turned on, the safety device of the compressor will work and the compressor will not operate for 90 seconds.

1.9. PUMP DOWN SWITCH

When the PUMP DOWN SWITCH (SW1) is pressed for 5 seconds or more, the total A/C system will start its TEST RUN automatically and the compressor frequency will be 55 Hz.

When operating only the outdoor unit (cooling 55Hz fixed mode) to make only the outdoor unit run in cooling mode,and apply a voltage of 230 V AC to N and L on the terminal board and push the PUMP DOWN SWITCH. (SW1) (Avoid operating the outdoor unit alone for long periods of time.)

1.10. CONTROL OF COMPRESSOR OR AND EXPANSION VALVE

For 90 seconds after turning on the AC power, the compressor will not be activated even if indoor units request the compressor to do so.

If the compressor receives a request from one or more indoor units indoor units after 90 seconds have passed, it will be turned on and the expansion valve corresponding to the requesting indoor unit will be opened.

When the indoor unit of a room requests for the cooling operation to the outdoor unit and it runs responding to the request, requests for the heating can't be accepted if the indoor units in other rooms send individual requests.

If the indoor unit in another room sends a request for the heating operation, the operation lamp and timer lamp of the indoor unit in that room start flashing in turn to inform that the unit is in the standby mode.

If the operation in one room is stopped while the indoor unit in another room is in the stand-by mode, the operation mode requested by the indoor unit which is now in the stand-by mode will be accepted.

At this time, the compressor will be temporarily stopped to switch the four-way valve and restart after 90 seconds.

During the cooling or dry operation, the expansion valve corresponding to the indoor unit that is not running is closed.

Therefore, the refrigerant will not flow into those units.

However,if the heating operation is in progress, it is possible that it flows into indoor units which are out of operation depending on the cycle conditions.

As a result, the indoor exchanger may be heated up even if it is not activated. This is not abnormal.

When the operations in all rooms are stopped, the compressor is stopped,the expansion valves in all rooms are fully opened.

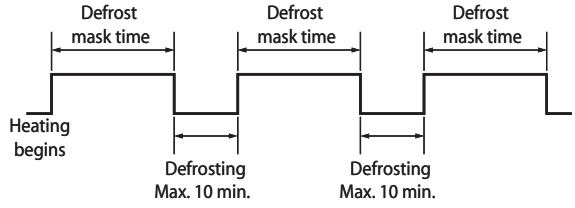
1.11. DEFROST OPERATION

(1) Overview

Defrosting begins during heating if the conditions for compressor operation time and outdoor heat exchanger temperature are met.

When defrosting begins, the indoor and outdoor fans stop.

Defrosting stops when the temperature of the outdoor heat exchanger goes above approximately 15°C.or defrosting time exceeds 10 minutes.

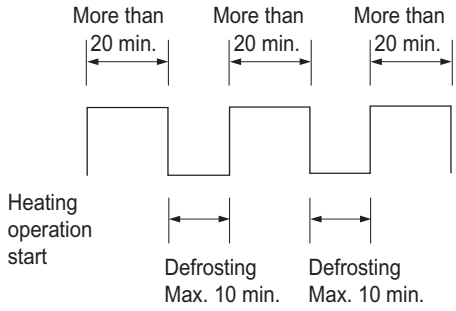


(2) Defrosting

If the compressor operation time is more than 20 minutes in the heating mode and the outdoor air temperature and outdoor heat exchange temperature satisfy the defrosting conditions, the defrosting operation is started.

When the defrosting operation is started, the indoor fan starts to run intermittently.

When the outdoor heat exchanger temperature reaches approx. 15°.C or above or when the defrosting time exceeds 10minutes, the defrosting operation is quit.



(3) During defrosting

When defrosting begins, the compressor stops.

Approximately 1 minutes later, the compressor reactivates in the refrigeration cycle, and the outdoor heat exchanger is defrosted.

Each mode is as follows:

The outdoor fan is stopped

The operating frequency is as shown in the table below

The indoor fan is stopped

All expansion valve are open.

for 5 minutes 3900 rpm

after that 3700 rpm

(4) Defrost stop

When defrosting time exceeds 10 minutes

When the temperature of the outdoor heat exchanger rises above approximately 15°C .

Defrost stop is determined by either of the above conditions, and the compressor is stopped.

At the same time, the outdoor fan go ON.

The compressor is reactivated in the heating cycle 1 minutes after it was stopped, and normal control resumes.

1.12. Power factor module Output voltage

If a voltage error over 450V is detected at power factor module output voltage, the compressor is stopped for 3 minutes. In this case, the outdoor fan does not stop, for 3 minutes, and another try will be made.

Three retries are allowed. On the fourth retry, a complete stop request signal is sent to the indoor unit, and the outdoor unit will remain stopped until reset is performed. At this time, the 3 minute delay for control of the outdoor unit will not function; therefore, do not cancel by removing the plug and cutting the power.

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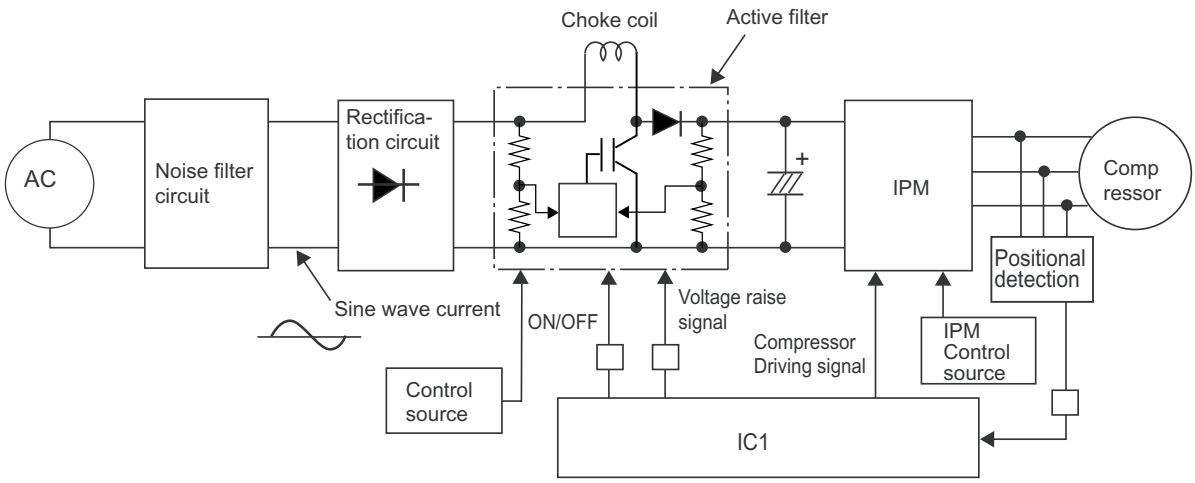
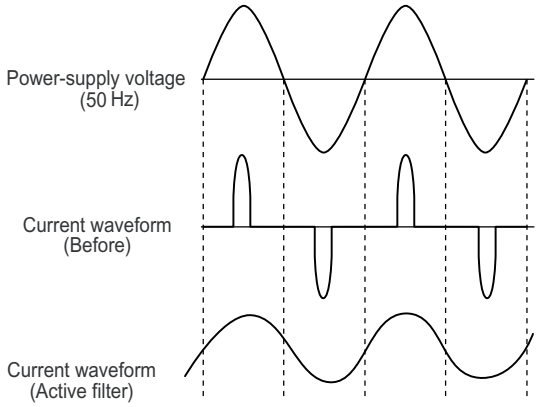
2. Active Filter Circuit

This circuit uses active filter and IPM as the figure below for the high efficiency operation of compressor.



2.1. Active Filter

In the case the direct current is obtained by the diode bridge and smooth capacitor from the commercial power source, the current wave shape will be the pulse shape at the peak of the voltage wave shape as shown in the figure below. For this reason, the harmonic current will be generated and at the same time the power factor will be deteriorated. While monitoring the AC input voltage in the control circuit, in order to be the same phase and wave shape as this voltage wave shape, IGBT is made ON/OFF by the carrier frequency of approximately 20 kHz. By adoption of this active filter, the current wave shape can be made to the sine wave synchronized to the commercial power source and the power factor can be made to almost 99%. As a result of this, reactor can be disused. Active filter works for the improvement of power factor and as the countermeasures for the harmonic current.



2.2. Active Filter Voltage Raise Circuit

The IGBT in the figure below is the switching transistor of the active filter. By adding ON signal to the gate of IGBT from the control IC, IGBT turns ON and the collector current Ic flows. This current flows from the + side of the diode bridge DB to the Choke coil, the - side of the diode bridge DB through IGBT from the Choke coil L. At this time, energy is stored in the choke coil L. Next, when gate signal of IGBT turned OFF, IGBT will be turned OFF and the energy stored in L during the ON time of IGBT will be discharged through the diode D, electrolytic capacitor C, load, primary side and the + side of DB. Assuming the input voltage of active filter (voltage between + and - of DB) as Ei, the output voltage (voltage at the both ends of smooth capacitor) as Vo, switching cycle of IGBT as T and ON time of IGBT as ton, the voltage between collector emitter of IGBT Vs will be as follows;

Vs= 0 (during ON of IGBT: ton)

Vs= Vo (during OFF of IGBT: T-ton)

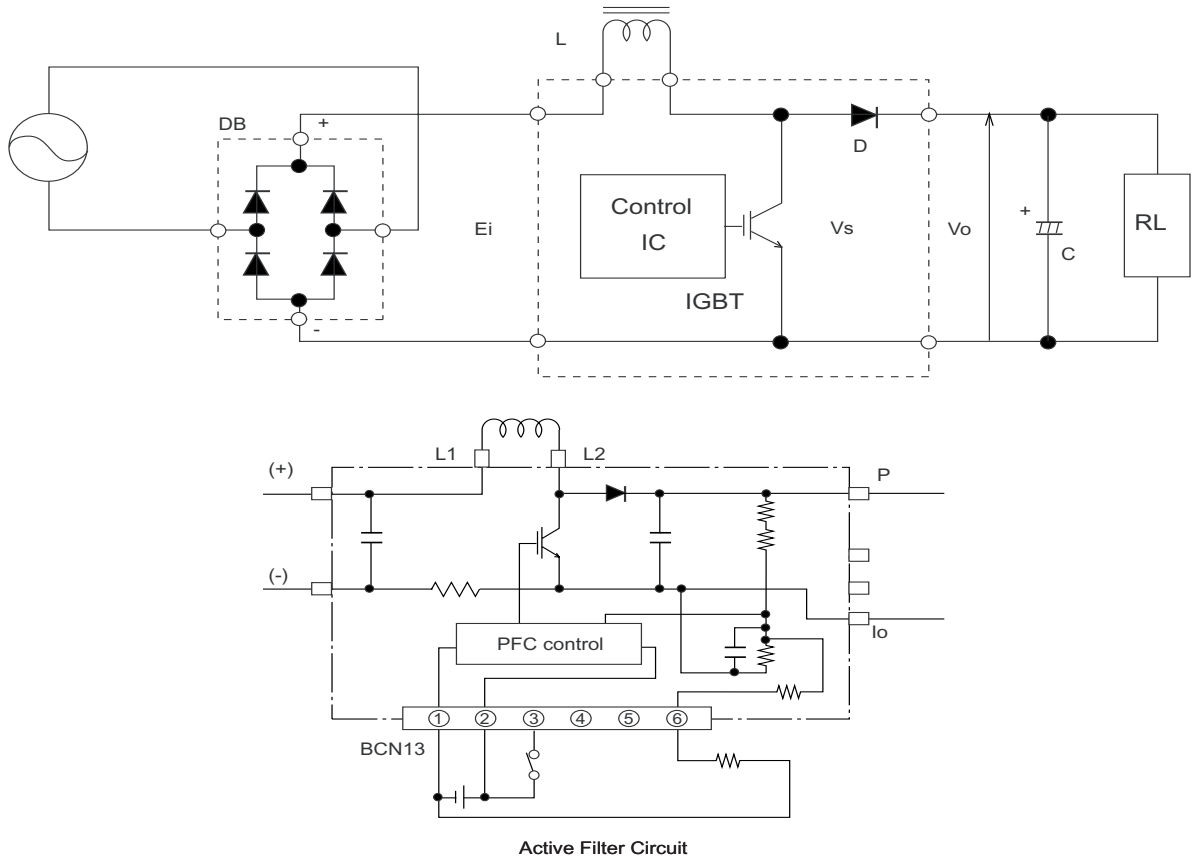
Here, assuming no loss in L and IGBT, average value of Vs turns equal to Ei,

Ei=(T-ton)/T x Vo

Therefore

Vo=T/(T-ton) x Ei

As ton is a smaller value than T, output voltage Vo will be higher than input voltage Ei.



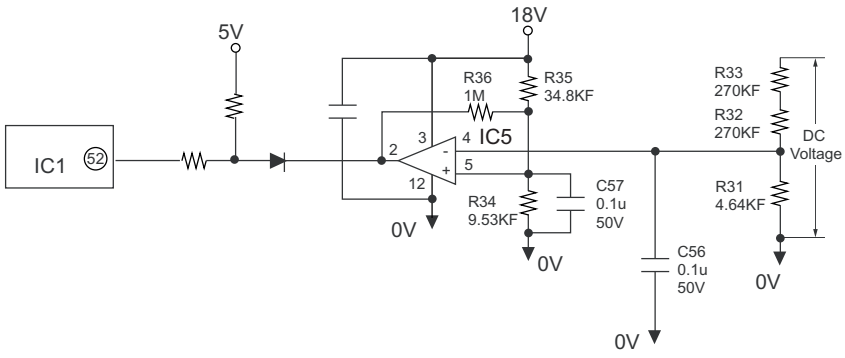
Active Filter Circuit

2.3. Active Filter Driving Electronics Circuit

At the operation of compressor, the microcomputer (IC1), as the 50th pin gets “H”, will turn the transistor Q4 ON through the transistor Q3. By this, 18V is supplied to the 3rd pin of connector BCN13 of the active filter and the active filter will be turned ON.

2.4. Protection Circuit of Active Filter

In order to prevent from the destruction of active filter due to the excessive over or under output voltage of active filter,the active filter will be turned OFF immediately at the abnormal output voltage by monitoring the output voltage. At the same time, the operation of compressor will be stopped. Detection circuit of the abnormal voltage detects the abnormal voltage by inputting the output voltage of active filter to the 2nd and 4th pins of comparator IC (IC5) at the divided voltage by the resistors (R31, R32 and R33) and comparing with reference voltage. When the output voltage of active filter reaches 450V or higher, the 4th pin of IC5 will be higher than the reference voltage at the 5th pin, the output of comparator will be reversed (H-L), the L signal will be entered at the 52nd pin of microcomputer (IC1) and the operation of the active filter will be stopped.



2.5. Explanation of IPM drive circuit

The power supply for the IPM drive, and the shunt resistance for over current detection, etc., are provided out of the IPM (in control PWB).

2.5.1 IPM drive power supply circuit

The power supply for driving the upper-phase IGBT (HU, HV, HW) drive employs a bootstrap system.

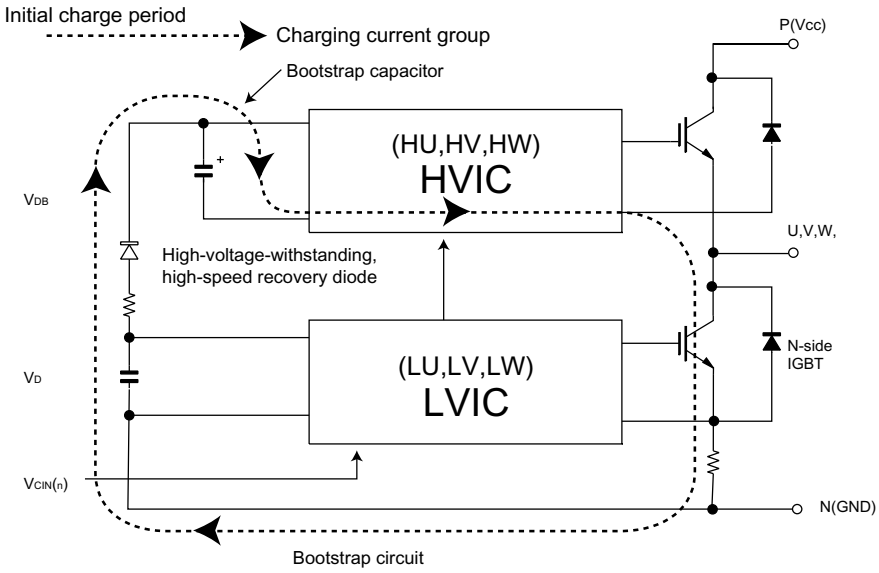
The 15-V power supply for the lower-phase IC is provided by the control printed circuit board (PWB).

1. Brief explanation of bootstrap system (single power drive system)

To supply power to the upper-phase IC, the microcomputer (IC1) turns ON the lower-phase IGBT (LU, LV, LW).

It results in a charging current that flows through the electrolytic capacitor in each upper-phase IC input and charges the bootstrap capacitor up to 15V voltage.

The power supply for the subsequent stages is stored when the lower-phase IGBT is ON in common drive control of the compressor.

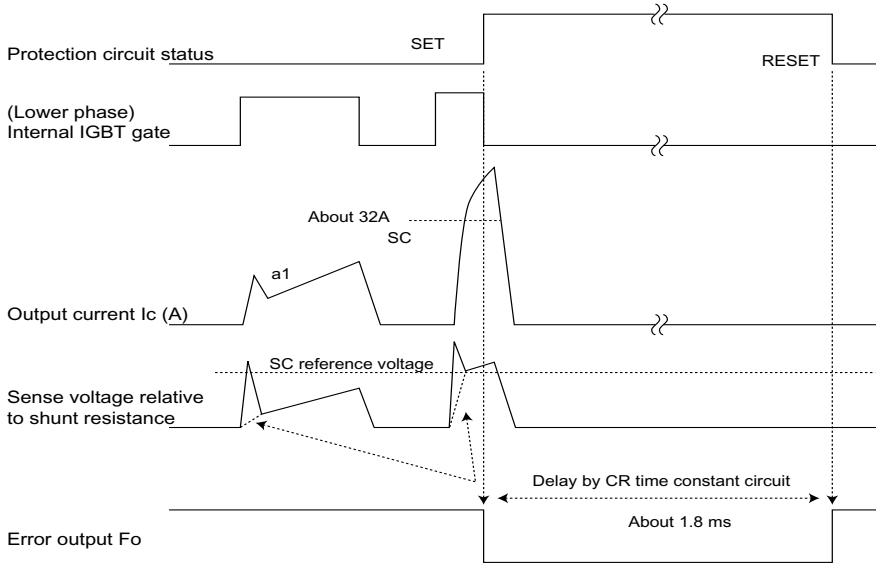


2.5.2

1. DC overcurrent detection circuit

When a current about 32A or higher flows through the shunt resistance (R100) on IPM printed circuit board (PWB), the voltage on this resistance is input to IPM CIN pin (16). Then, the gate voltage of the lower-phase IGBT (LU, LV, LW) inside the IPM turns OFF to cut the overcurrent off.

At the same time, an L output which lasts about 1.8 ms is generated from IPM Fo pin (18), and it results in an L level input to overcurrent detection input pin (53) of the microcomputer (IC1) and then turns OFF the compressor driving signal output (IC1 from pins (65) to (70)) to the IGBT gate.



2.6.

2.6.1 120° energizing control (digital position detection control)

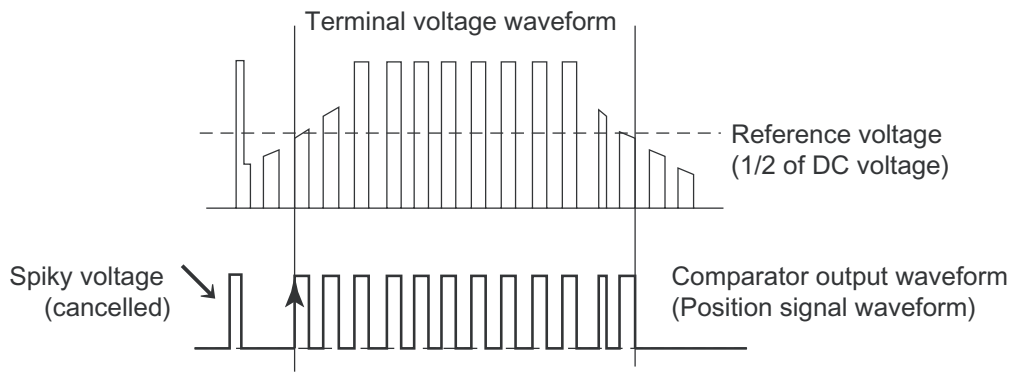
This control system detects the digital position detection signal and adjusts the rate of acceleration/deceleration accordingly.

The motor's induced voltage waveform is input to the comparator in the form of PWM-switched pulse, and a position detection signal is generated as a reference voltage which is equal to 1/2 of 370 VDC. However, since there is no induced voltage waveform when the PWM waveform is OFF, the

microcomputer works in an internal processing so that detection is enabled only when it is ON. Based on the position signal detected, actual PWM waveform output timing is determined. Since it does not use a filter circuit, the accuracy of detection.

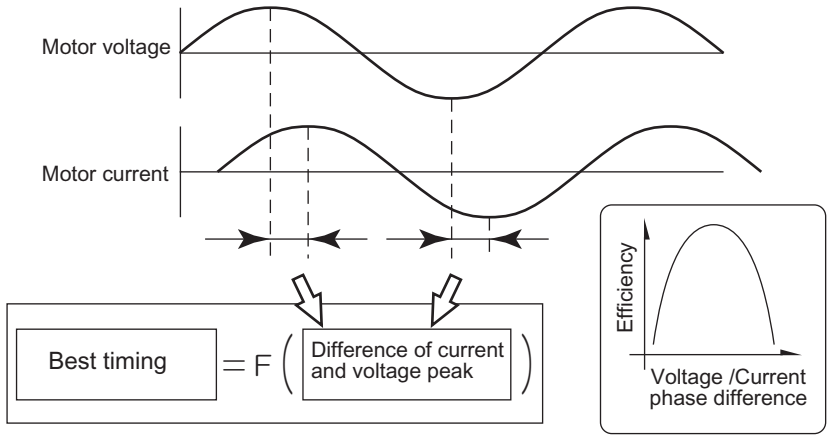
The microcomputer works in an internal processing to eliminate spiky voltage during the regenerative process.

Furthermore, even if the induced voltage is low, position detection is still possible, and it allows sensor-less operation at low rotation speed in the initial stage of operation. These reduce the starting current and improve reliability of IPM.



2.6.2 180° energizing control

This is the control system to moderate the speed by the current phase difference for higher efficiency and lower noise of the compressor. The current phase difference control is the control system paid attention to the interrelation between efficiency and phase gap generated by the applied voltage of motor and current in the coil of motor as shown in the figure below.

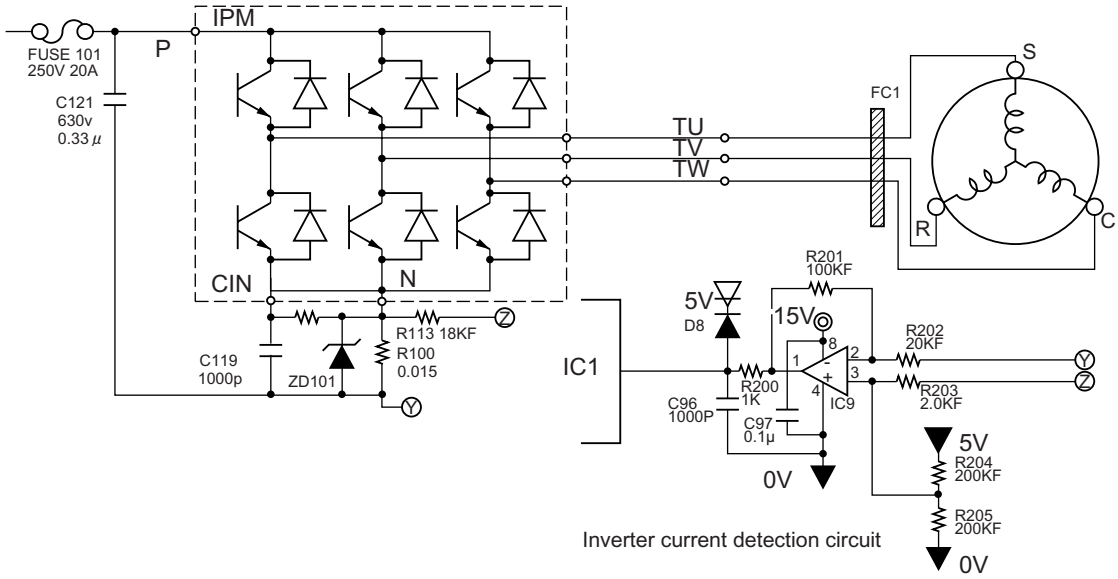


Concept chart of the current phase difference control

This control is the forced magnetization system independent of the location of rotor, detecting the phase difference between driving voltage phase and line current phase flowing in motor coil, and controls the modulation rate data to get the phase difference at the best efficiency.

2.7. DC Current Detection Sensor Circuit

Control of current phase difference is made by reading in the phase difference generated at the both edges of shunt register (R100) by the compressor electrifying current on the PWB through the Op-amp (IC9) to the microcomputer. This is a control to modulate up to the phase with the best efficiency by comparing the phase of this input current, so called compressor electrifying current, with the compressor driving voltage. In the case that phase difference between motor voltage and current is large (current delay is large), the control will be made by lowering the compressor modulation rate data (compressor effective value).



Inverter current detection circuit

CHAPTER 3. FUNCTION AND OPERATION OF PROTECTIVE PROCEDURES

[1] PROTECTIVE FUNCTIONS AND OPERATIONS

FUNCTION AND OPERATION OF PROTECTIVE PROCEDURES

NO.	Function	Operation					
		Description	Detection time	Restart condition	Restarts time	In door	Out door
1	DC over current	Compressor is stopped if a current approximately 50A or more flows in the power transistor module.	During compressor operation	Automatically restarts after safety time(180 seconds)	4 times	Yes	Yes
2	AC over current	Lowers the operating frequency if the compressor AC current exceeds set value(※). Stops the compressor if the current exceeds at minimum frequency.	During compressor operation	Automatically restarts after safety time (180 seconds)	4 times	Yes	Yes
3	Compressor overheat prevention control	Lowers the operating frequency if the temperature of the compressor thermistor (TH1) rises above 108℃ . Compressor is stopped if the thermistor stays above 108 ℃ for 2 minutes at minimum frequency.	During compressor operation	Automatically restarts after safety time (180 seconds)	No limit	No	No
4	Compressor high temperature error	Compressor is stopped if the compressor thermistor is above 113 ℃ (Or when TH1 shorts)	During compressor operation	Automatically restarts when thermistor (TH1) temperature falls below 99 ℃ (approximately 30 minutes)	4 times	Yes	Yes
5	Outdoor heat exchanger overheat prevention control	Lowers the operating frequency if the temperature of the outdoor heat exchanger rises above 57℃ during cooling. Stops the compressor if the temperature stays above 57℃ for 2 minutes at minimum frequency	During compressor operation	Automatically restarts after safety time (180 seconds)	No limit	No	No
6	Thermistor short	Compressor ia stopped, if heat exchanger or outdoor thermistor shorts. Close the expansion valve of the corresponding room, if some suction thermistor shorts.	When the room is activated turns ON and the compressor starts.	Operation OFF	1 time	Yes	Yes
7	Thermistor open	Compressor is stopped, if compressor or heat exchanger or outdoor thermistor opens. Close the expansion valve of the corresponding room, if some suction thermistor shorts. opens.	When the room turns ON and the compressor starts.	Operation OFF	1 time	Yes	Yes

※ 19.3A

NO.	Function	Operation					
		Description	Detection time	Restarts condition	Restarts time	In door	Out door
8	AC abnormal current	Compressor is stopped, if the operating frequency is above 70Hz and the compressor current is below 0.8A.	During compressor operation	Automatically restarts after safety time (180 seconds)	4 times	Yes	Yes
9	Serial signal error	INDOOR If open, while timer LED blinks, operation is continued. If short, operation is continued. OUTDOOR Closes the expansion valve of the corresponding room if the outdoor unit does not receive a serial signal from one or more indoor unit for 30 seconds. Compressor is stopped, if the outdoor unit does not receive a serial signal from all indoor units.	During operation	Automatically restarts as soon as the serial communication becomes possible.	No limit	Yes	Yes
10	Miswiring check error	Compressor is stopped, and miswiring check operation ends.	During miswiring operation	Miswiring check operation will not restart automatically.	4 times	Yes	Yes
11	Indoor heat exchanger overheat prevention control	Lowers the operating frequency if the temperature of any of indoor heat exchanger rises high temperature during heating. Stops the compressor if the temperature srays high for 2 minutes at minimum frequency.	During compressor operation	Automatically restarts after safety time.(180 sec.)	No limit	No	No
12	Power factor module (Active filter) over voltage error	Compressor stops if DC voltage is 450V or higher.	During compressor operation	Automatically restarts after safety time.(180 sec.)	4 times	Yes	Yes
13	Power factor module (Active filter) low voltage error	Compressor stops if DC voltage is 280V or lower.	During compressor operation	Automatically re starts after safety time.(180 sec.)	4 times	Yes	Yes
14	Power factor module (Active filter) clock error	When power source frequency cannot be detemined (at startup). or when power source clock cannot be detected for 1 continuous second (at startup).	At compressor startup,when in operation.	Compressor continues operation without stopping.	None	Yes	Yes
15	Outdoor unit DC fan error	Operation stops if there is no input of rotation pulse signal from outdoor unit fan motor for 30 seconds.	When outdoor unit fan is in operation.	Operation OFF or ON	Yes ☆ 1	Yes	Yes
16	DC Compressor rotation error	In the case that the feed back signal from the compressor is not input or abnormal.	During compressor operation	Automatically restarts after safety time.(180 sec.)	8 times	Yes	Yes
17	IPM overheat prevention control. IPM high temperature error	Lowers the operating frequency if the temperature of IPM rises high temperature. Stops the compressor if the temperature srays high for 2 minutes at minimum frequency.	During compressor operation	Automatically restarts after safety time.(180 sec.)	No limit	No	No
18	Thermal fuse error	When thermal fuse in the outdoor terminal board blew.		Operation OFF	1 time	Yes	Yes

☆ 1-The outdoor unit restarts four times before the indoorunit error is displayed(compiete shutdown).

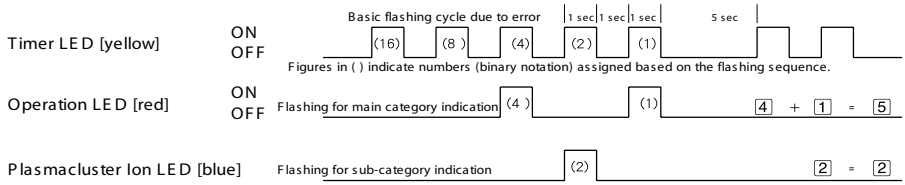
TROUBLESHOOTING GUIDE

1. SELF-DIAGNOSIS FUNCTION AND DISPLAY MODE

(1) To call out the content of the self-diagnosis memory, hold down the emergency operation button for more than five seconds when the indoor unit is not operating.
   a) According to the content of the self-diagnosis memory, the Operation LED (main category) and the Plasmacluster Ion LEDs (sub-category) flash in sync with the Timer LED on the indoor unit.
   b) In the event a complete shutdown occurs due to a malfunction, the Operation LED (red), Timer LED (yellow), Plasmacluster Ion LED (blue), and Plasmacluster Ion LED (green) flash to indicate the general information of the generated malfunction.
   c) If the power cord is unplugged from the AC outlet or the circuit breaker is turned off, the self-diagnosis memory loses the stored data.

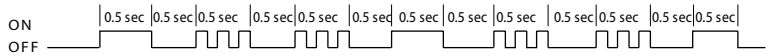
(2) Display of detailed self-diagnosis result with main category and sub-category indications
When malfunction information is called out, the main category and sub-category of the self-diagnosis result are indicated by the Operation, Timer, and Plasmacluster Ion LEDs on the indoor unit.

*1: Example of self-diagnosis result displayed on indoor unit: Suction thermistor open-circuit error (Malfunction No. 5 – 2; Main category, Sub-category)



*2: The self-diagnosis display function of the outdoor unit indicates the error information by flashing LED1 on the outdoor unit according to the content of self-diagnosis.
The self-diagnosis display function of the outdoor unit is active only for about 3 to 10 minutes after self-diagnosis is performed during operation, and the display returns to normal condition after this display period.
The content of self-diagnosis cannot be called out by the self-diagnosis display function of the outdoor unit.

Example of self-diagnosis display on outdoor unit : Compressor high-temperature abnormality



⊗Flashes in 1-sec intervals (normal) : 1sec ON / 1sec OFF ✕: OFF ○: Flashes 3 times in 0.2-sec intervals

Status of indoor/outdoor units	Indication by LED1 on outdoor unit *2	Indication on indoor unit: Floor / ceiling — Lighting pattern at the time of timer lamp lighting (● ● ● ● ● → ✕ for 5 seconds)	Indication on indoor unit: Floor / ceiling	Wall (Panel) Main	Wall (Panel) Sub	Wall(Grill) Main	Content of diagnosis: Main category	Content of diagnosis: Sub category	Inspection location/method	Remedy
Indoor/outdoor units in operation	Normal flashing			0	-0	0		Normal	–	–
Indoor/outdoor units incomplete shutdown	○ 1 time	●	Operation lamp(RED) Cluster lamp(BLUE)	1	-0	1	Outdoor unit thermistor short-circuit	Heat exchanger thermistor short circuit error	(1)Measure resistance of the outdoor unit thermistors. (TH2~4,6~9 : Approx.4.4 k at 25 ℃) (2)Check the lead wire of the outdoor unit thermistor for torn sheath and short-circuit. (3)No abnormality found in above inspections (1)and (2).	(1)Replace the outdoor unit thermistor assembly. (2)Replace the outdoor unit thermistor assembly. (3)Replace the outdoor unit control PCB assembly.
		● ●	Operation lamp(RED) Cluster lamp(BLUE)		-1			Outdoor temperaturethermistor short-circuit error		
		● ●	Operation lamp(RED) Cluster lamp(BLUE)		-2			Suction thermistor short-circuit error		
		● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-3			Thermistor Unit A - D thermistor short-circuit error		
Indoor/outdoor units in complete shutdown	○ 2 time	●	Operation lamp(RED) Cluster lamp(BLUE)	2	-0	2	Cycle temperature	Compressor high temperature error Suction thermistor open circuit error	(1)Check the outdoor unit air outlet for blockage. (2)Check if the power supply voltage is 90 V or higher at full power. (3)Check the pipe connections for refrigerant leaks. (4)Measure resistance of the outdoor unit compressor thermistor. (TH1:Approx.53 k at 25 C) (5)Check the expansion valve for proper operation.	(1)Ensure unobstructed air flow from the outdoor unit air outlet. (2)Connect power supply of proper voltage. (3)Charge the specified amount of refrigerant. (4)Replace the outdoor unit compressor thermistor assembly. (5)Replace the expansion valve coil,expansion valve or outdoor unit control PCB assembly.
Indoor unit in operation Outdoor unit in temporary stop		● ●	Operation lamp(RED) Cluster lamp(BLUE)		-1			Temporary stop due to compressor discharge overheat *3	(Temporary stop for cycle protection)	–
		● ●	Operation lamp(RED) Cluster lamp(BLUE)		-2			Temporary stop due to out door unit	(Temporary stop for cycle protection)	–
		● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-3			Temporary stop due to indoor unit heat exchanger overheat *3	(Temporary stop for cycle protection)	–
		● ●	Operation lamp(RED) Cluster lamp(BLUE)		-4			Temporary stop due to IPM overheat *3	(Temporary stop for parts protection)	–
		● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-5			IPM high temperature error	(1)Measure resistance of the heat-sink thermistor.(CN8B)	(1)Change the heat-sink thermistor.
Indoor/outdoor units in complete shutdown	○ 5 time	● ●	Operation lamp(RED) Cluster lamp(BLUE)	5	-0	5	Outdoor unit thermistor open-circuit	Heat exchanger thermistor open-circuit error	(1)Check connector CN8A and CN8C of the outdoor unit thermistor for secure installation. (2)Measure resistance of outdoor thermistors TH1~4,6~9. (3)Check the lead wires of thermistors TH1~4,6~9 on the outdoor unit control PCB for open-circuit. (4)No abnormality found in above inspections (1)through (3).	(1)Correct the installation. (2)Replace the outdoor unit thermistor assembly. (3)Replace the outdoor unit thermistor assembly. (4)Replace the outdoor unit control PCB assembly.
		● ●	Operation lamp(RED) Cluster lamp(BLUE)		-1			Outdoor temperature thermistor open-circuit error		
		● ●	Operation lamp(RED) Cluster lamp(BLUE)		-2			Suction thermistor open circuit error		
		● ●	Operation lamp(RED) Cluster lamp(BLUE)		-4			Discharge thermistor open-circuit error		
		● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-5			Thermistor Unit A - D thermistor open-circuit error		
Indoor/outdoor units in complete shutdown	○ 6 time	● ● ● ●	Operation lamp(RED) Cluster lamp(BLUE)	6	-0	6	Outdoor unit DC Current	DC overcurrent error	(1)IPM continuity check (2)Check the IPM and heat sink for secure installation. (3)Check the outdoor unit fan motor for proper rotation. (4)No abnormality found in above inspections (1)through (3). (5)No abnormality found in above inspections (1)through (4).	(1)Replace the outdoor unit IPM PCB assembly. (2)Correct the installation (tighten the screws). Apply silicon grease. (3)Replace the outdoor unit fan motor. (4)Replace the outdoor unit IPM PCB assembly. (5)Replace the compressor.
		● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-1			IPM pin level error	(1)Check the IPM is attached correcity to the outdoor unit IPM PWB.	(1)Replace the outdoor unit IPM PWB assembly.
Indoor/outdoor units in complete shutdown	○ 7 time	● ● ●	Operation lamp(RED) Cluster lamp(BLUE)	7	-0	7	Outdoor unit AC Current	AC overcurrent error	(1)Ensure unobstructed air flow from the outdoor unit air outlet. (2)Check the outdoor unit fan motor.	(1)Ensure unobstructed air flow from the outdoor unit air outlet. (2)Check the outdoor unit fan motor.
		● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-1			AC current error when OFF	(1)IPM continuity check	(1)Replace the outdoor IPM PWB
		● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-2			AC maximum current error	(1)Ensure unobstructed air flow from the outdoor unit air outlet. (2)Check the outdoor unit fan motor.	(1)Ensure unobstructed air flow from the outdoor unit air outlet. (2)Check the outdoor unit fan motor.
		● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-3			AC current deficiency error	(1)Replace the outdoor unit control PCB assembly. (2)Charge the specified amount of refrigerant. (3)Correct refrigerant clogs. (Stop valve,pipe,expansion valve)	(1)Replace the outdoor unit control PCB assembly. (2)Charge the specified amount of refrigerant. (3)Correct refrigerant clogs. (Stop valve,pipe,expansion valve)
Indoor/outdoor units in complete shutdown	○ 8 time	●	Operation lamp(RED) Cluster lamp(BLUE)	8	-0	8	Abnormal wire check	Abnormal wire check error	(1)Check the expansion valve. (unit A - D) (2)Are four expansion valves connected by mistake (3)Check the wiring between units.	(1)Replace the outdoor control board assembly. (2)Reattach (3)Check the wiring between units.
	○ 9 time	● ●	Operation lamp(RED) Cluster lamp(BLUE)	9	-4	9	Cycle temperature	4 way valve error or Gas leak error	(1)Check to make sure outdoor unit thermistor TH2 (exchange) is installed in correct TH3 (pipe temperature) poctions. (2)Check if the refigerant volume is abnomally low. (3)Check the 4-way valve for proper operation.	(1)Correct the installation. (2)Change the speccified amount of refrigerant. (3)Replace the 4-way valve.
Indoor/outdoor units in complete shutdown	○ 11 time	● ● ●	Operation lamp(RED) Cluster lamp(BLUE)	11	-0	11	Outdoor unit DC Fan	Outdoor unit DC fan rotation error	(1)Check connector CN3 of the outdoor unit DC fan motor fo r secure installation. (2)Check the outdoor unit fan motor for proper rotation. (3)Check fuse FUSE5. (4)Outdoor unit control PCB	(1)Correct the installation. (2)Replace the outdoor unit fan motor. (3)Replace the outdoor unit control PCB assembly. (4)Replace the outdoor unit control PCB assembly.
Indoor/outdoor units in complete shutdown	○ 12 time	● ●	Operation lamp(RED) Cluster lamp(BLUE)	12	-0	12	Thermal fuse in terminal board	Thermal fuse error in terminal board (for power supply)	(1)Check the thermal fuse in terminal board (for Power supply) (2)Check connector CN5 of the outdoor unit.	(1)Replace terminal board for Power supply (2)Replace the outdoor unit control PCB assembly.

⊗Flashes in 1-sec intervals (normal) : 1sec ON / 1sec OFF **X**: OFF ○: Flashes 3 times in 0.2-sec intervals

Status of indoor/outdoor units	Indication by LED1 on outdoor unit *2	Indication on indoor unit: Floor / ceiling — Lighting pattern at the time of timer lamp lighting (● ● ● ● ● → X for 5 seconds)	Indication on indoor unit: Floor / ceiling	Indication on indoor unit: Wall (Panel) Main	Indication on indoor unit: Wall (Panel) Sub	Indication on indoor unit: Wall(Grill) Main	Content of diagnosis: Main category	Content of diagnosis: Sub category	Inspection location/method	Remedy
Indoor/outdoor units in complete shutdown	○ 13 time	● ● ●	Operation lamp(RED) Cluster lamp(BLUE)	13	-0	13	DC compressor	Compressor startup error	(1)Check the colors (red,white,orange)of the compressor cords for proper connection. (PWB side, compressor side) (2)Check if the IPM terminal resistance values are uniform. (3)Check if outdoor main relay (MRY1) turns on and voltage of both end of the condenser (C10) has become DC380V. (4)No abnormality found in above inspections(1)and(3). (5)No abnormality found in above inspections(1)and(4).	(1)Correct the installation. (U:Red,V:White,W:Orange) (2)Replace the outdoor unit control PWB assembly. (3)Replace the outdoor unit control PWB assembly. (4)Replace the outdoor unit control PWB assembly. (5)Replace the compressor.
		● ● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-1			Compressor rotation error. (at 120° energizing)		
		● ● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-2			Compressor rotation error (at 180° energizing)		
		● ● ● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-3			Detection error of inverter current.	(1)Check the circuit of detection of inverter current.	(1)Replace the outdoor unit control PCB assembly.
Indoor/outdoor units in complete shutdown	○ 14 time	● ● ●	Operation lamp(RED) Cluster lamp(BLUE)	14	-0	14	Outdoor unit active filter	Active filter overvoltage error	(1)Check the AC power supply voltage for fluctuation. (2)No abnormality found in above inspection (1). (3)Replace the Active filter.	(1)Connect stable power supply. (2)Replace the outdoor unit control PCB assembly.
		● ● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-1			Clock error	(1)Check the clock for proper inputt.	(1)Replace the outdoor unit control PCB assembly.
		● ● ● ●	Operation lamp(RED) Cluster lamp(BLUE)		-4			low valtage error	(1)Check the AC power supply valtage for fluntuation.	(1)Conect stable power supply. (2)Replace tfe outdoor unit control PCB assembly.
Indoor unit in operation Outdoor unit in complete shutdown	●	● ● ● ●	Operation lamp(RED) Cluster lamp(BLUE)	17	-0	17	Wires between units	Serial open-circuit	(1)Check the wires between units. (2)Check voltage between N and 1 the indoor/outdoor unit terminal boards.	(1)Connect stable power supply. (2)Replace the outdoor unit control PCB assembly.
	X	● ● ● ●	Operation lamp(RED) Cluster lamp(BLUE)					erroneous wiring	(1)Check the wires between units. (2)Check the outdoor unit fuse. (3)Check 15-V,13-V and 5-V voltages on the PCB. Check resistance between IPM terminals. (4)Check pins No.5 and 8 of connector CN3A of the outdoor unit fan motor for short-circuit. (5)Outdoor unit control PCB.	(1)Correct the wiring. (2)Replace the fuse/outdoor unit control PCB assembly. (3)Replace the outdoor unit control PCB assembly. (4)Replace the outdoor unit fan motor. (5)Replace the outdoor unit control PCB board.
Indoor unit in operation Outdoor unit in complete shutdown	●	●	Operation lamp(RED) Cluster lamp(BLUE)	18	-0	18	Wires between units	Serial short-circuit	(1)Check the wires between units.	(1)Correct the wiring.
		● ●	Operation lamp(RED) Cluster lamp(BLUE)		-1			Serial erroneous wiring	(1)Check the wires between units.	(1)Correct the wiring.
Indoor/outdoor units in complete shutdown	X	● ●	Operation lamp(RED) Cluster lamp(BLUE)	19	-0	19	Indoor unit fan	Indoor unit fan error	(1)Check the indoor fan motor for proper rotating operation. (Check fan lock.) (2)Check the lead wire of the indoor fan motor for open-circuit. (3)Check connector of the indoor unit fan motor for secure installation. (4)No abnormality found in above inspections (1)through (3).	(1)Replace the indoor fan motor. (2)Replace the indoor fan motor. (3)Correct the installation of CN3 of the indoor fan motor. (4)Replace the indoor unit control PCB.
Indoor/outdoor units in operation	X	● ●	Operation lamp(RED) Cluster lamp(BLUE)	20	-0	20	Indoor unit control PCB	EEPROM data error	(EEPROM read data error)	(1)Replace the indoor unit control PCB.
Indoor/outdoor units in operation	X	● ● ● ●	Operation lamp(RED) Cluster lamp(BLUE)	30	-0	30	Drain pump unit	Drain pump unit error	(1)Check connector CN2 and CN10.	(1)Replace the Drain pump unit unit. (2)Re-insertion of CN2 and CN10.

CHECK METHOD (OUTDOOR)

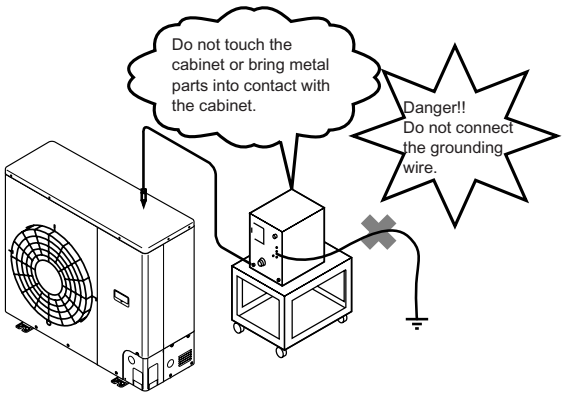
CAUTION IN CHECKING PRINTED CIRCUIT BOARDS (PWB)

Non-insulated control circuit

The GND terminals of the low-voltage circuits (control circuits for microcomputer and thermistors and drive circuits for expansion valve and relays) on the control printed circuit board (PWB) are connected to the compressor drive power supply (370-VDC negative terminal). Therefore, exercise utmost caution to prevent electric shock.

If a measuring instrument used for the test is grounded, its chassis (ground) has the same electric potential as the 0-V probe. Since non-insulated circuits have the following voltage potential difference from the ground, connection of the grounding wire results in a short-circuit between the 0-V line and the ground, thus allowing an excessive current to flow to the tester to cause damage.

If the sheaths of the thermistor lead wires or expansion valve lead wires inside the outdoor unit become damaged due to pinching by the front panel or other metal parts or contacting a pipe, a high voltage can flow and destroy the circuits. To prevent these problems, carefully conduct assembly work.



Reason

The oscilloscope (chassis ground) has the same electric potential as the 0-V probe. The entire electronic control section of the outdoor unit has a voltage potential difference from the ground. When the oscilloscope is set up, the 0-V line and the ground voltage (ground) will be short- circuited, resulting in an excessive current flow to cause damage to the oscilloscope or indoor electric circuits.

Figure 1

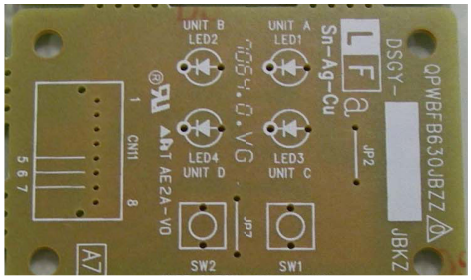
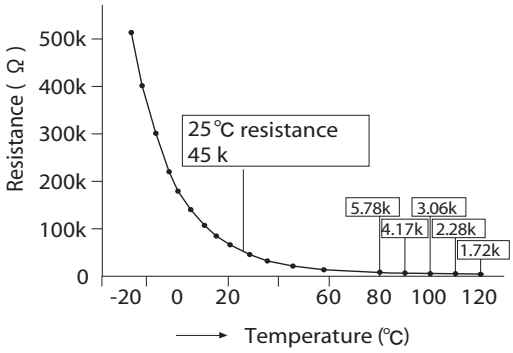
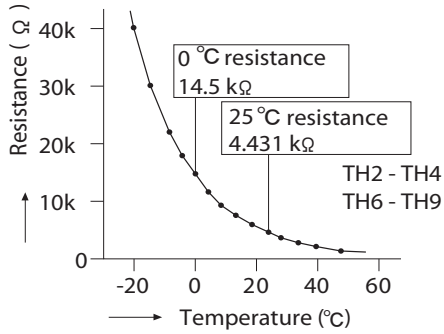
Cautions when attaching or removing the board
When operating only the outdoor unit (cooling 55 Hz fixed mode) To make only the outdoor unit run in cooling mode, and apply a voltage of 220 ~ 240V AC to L and N on the terminal board and push the PUMP DOWN SWITCH (SW1). (Avoid operating the outdoor unit alone for long periods of time.) 

Figure 2 Temperature properties of outdoor thermistors

TH2 : Heat exchanger pipe thermistor (CN8A③ - ④)
TH3 : Outdoor temp. thermistor (CN8A⑤ - ⑥)
TH4 : Suction thermistor (CN8A ⑦ - ⑧)
TH6 : Thermistor unit A (CN8C ① - ②)
TH7 : Thermistor unit B (CN8C ③ - ④)
TH8 : Thermistor unit C (CN8C ⑤ - ⑥)
TH9 : Thermistor unit D (CN8C ⑦ - ⑧)

TH1 compressor thermistor
(CN8A① - ②)

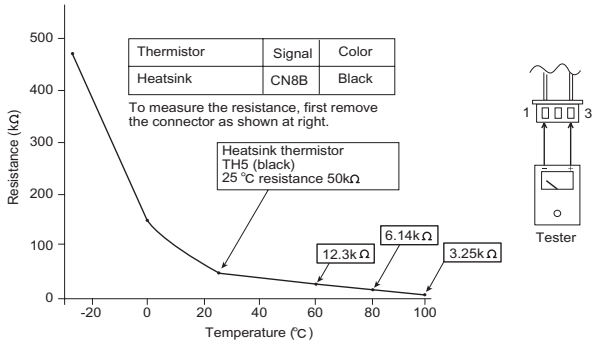




To measure the resistance, first remove the connector from the board.

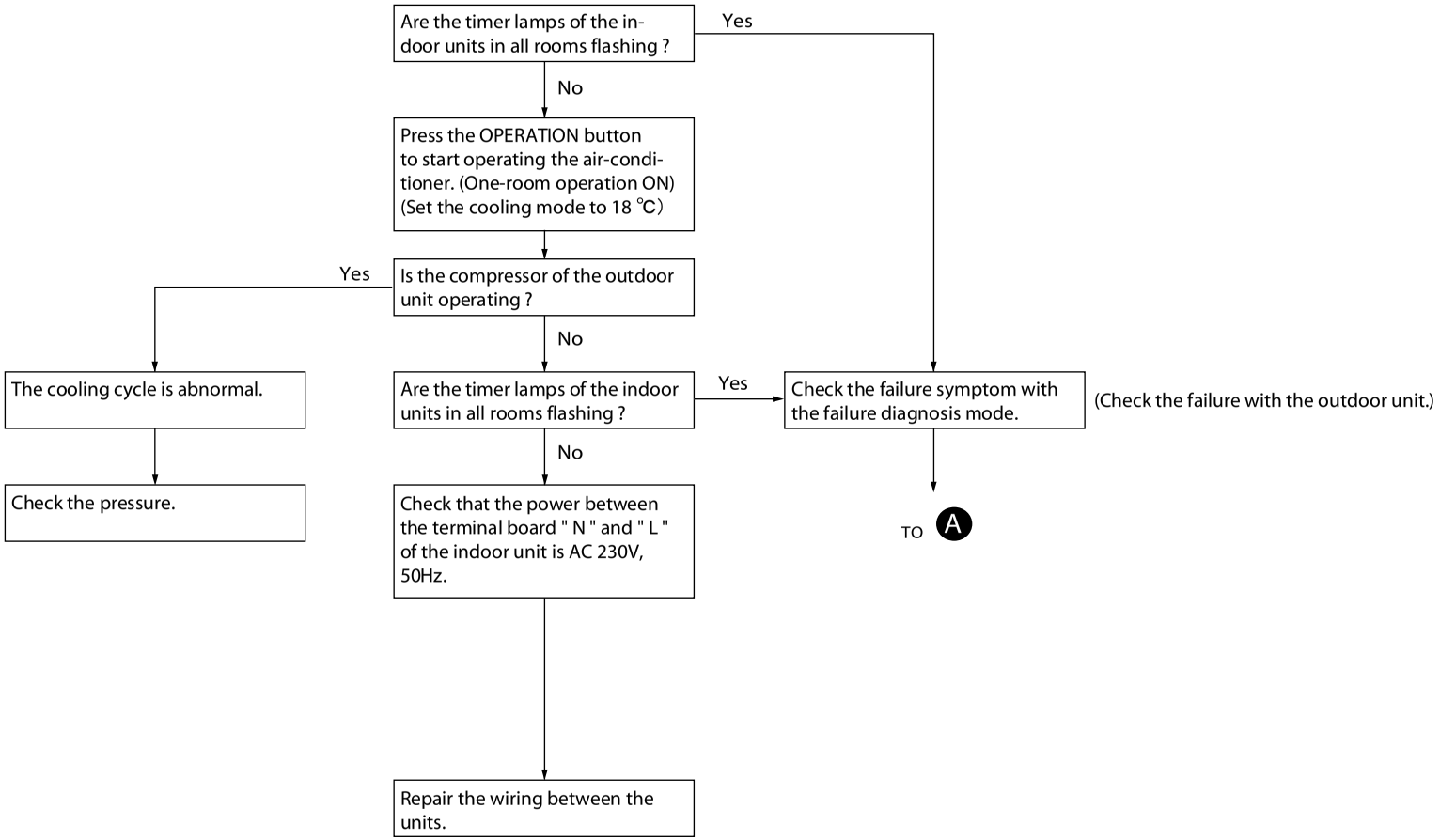
Thermistor	No.	Connector	Color	Connector pin
Compressor thermistor	TH1	CN8A	Red	No. 1 to 2
Heat exchanger pipe thermistor	TH2	CN8A	Orange	No. 3 to 4
Outdoor temp. thermistor	TH3	CN8A	Green	No. 5 to 6
Suction thermistor	TH4	CN8A	Black	No. 7 to 8
Thermistor unit A (suction)	TH6	CN8C	Blue	No. 1 to 2
Thermistor unit B (suction)	TH7	CN8C	White	No. 3 to 4
Thermistor unit C (suction)	TH8	CN8C	Brown	No. 5 to 6
Thermistor unit D (suction)	TH9	CN8C	Yellow	No. 7 to 8

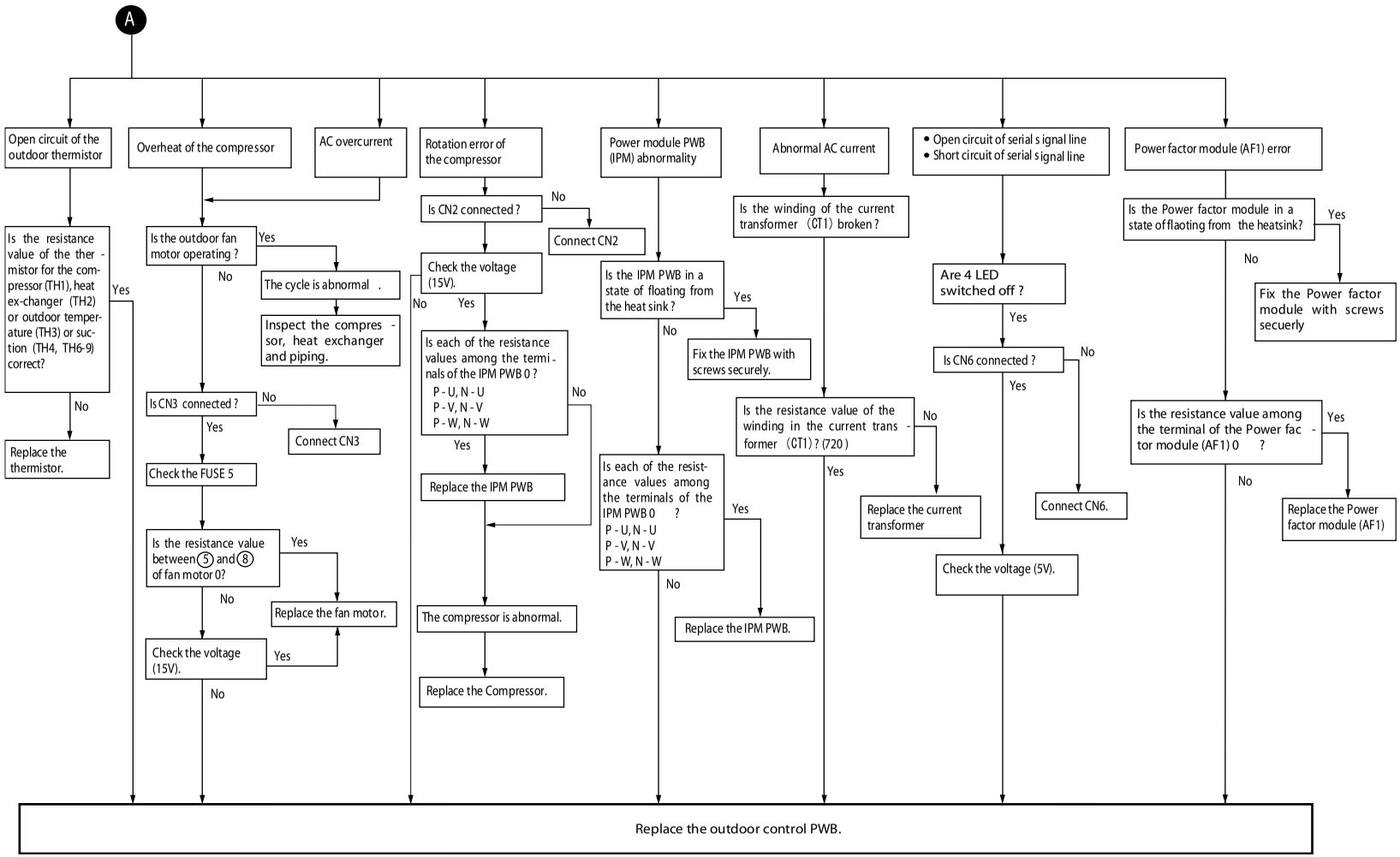
Figure 3 Temperature properties of heatsink thermistor



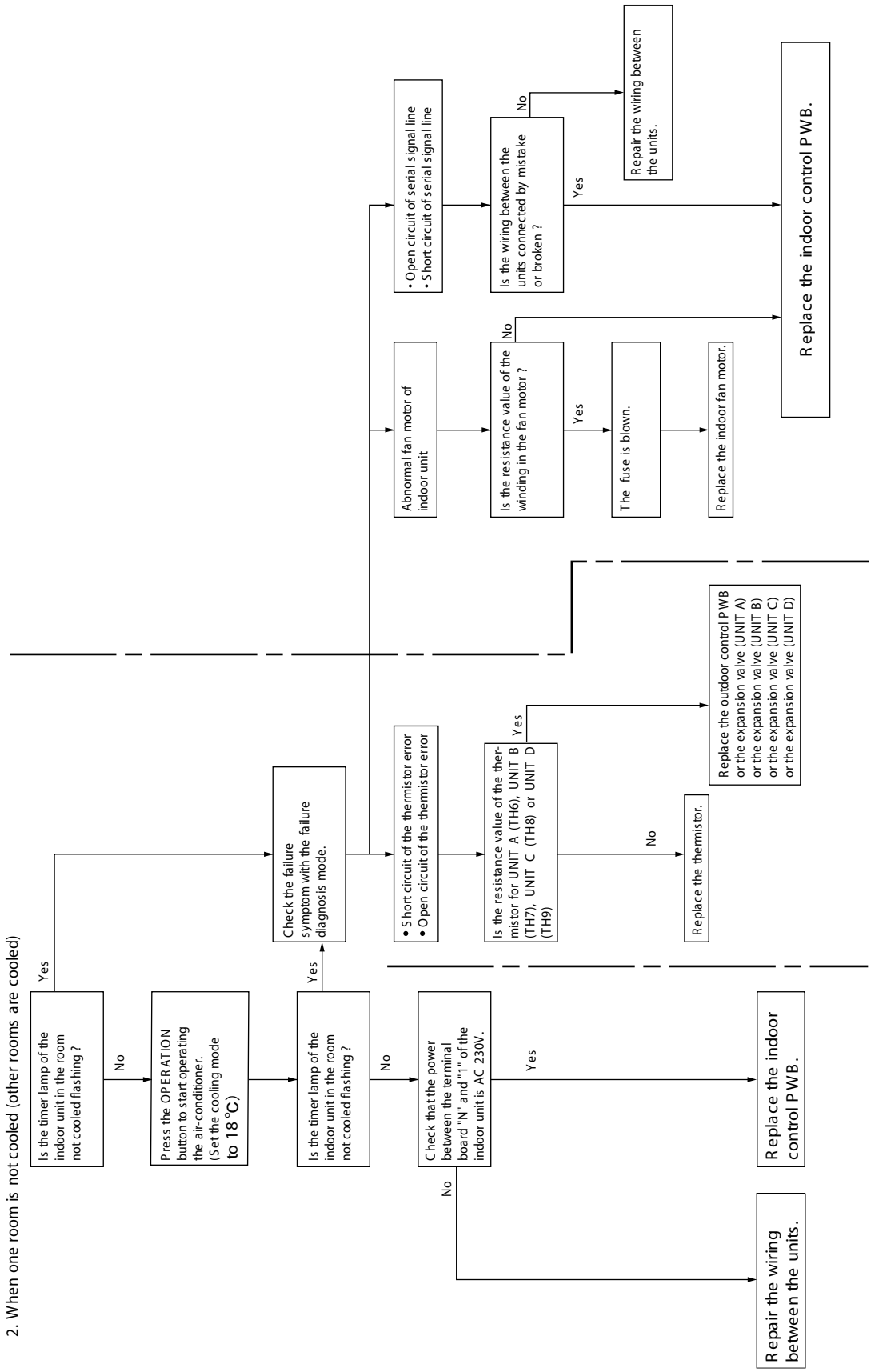
How to distinguish the defective parts

1. When all rooms are not cooled

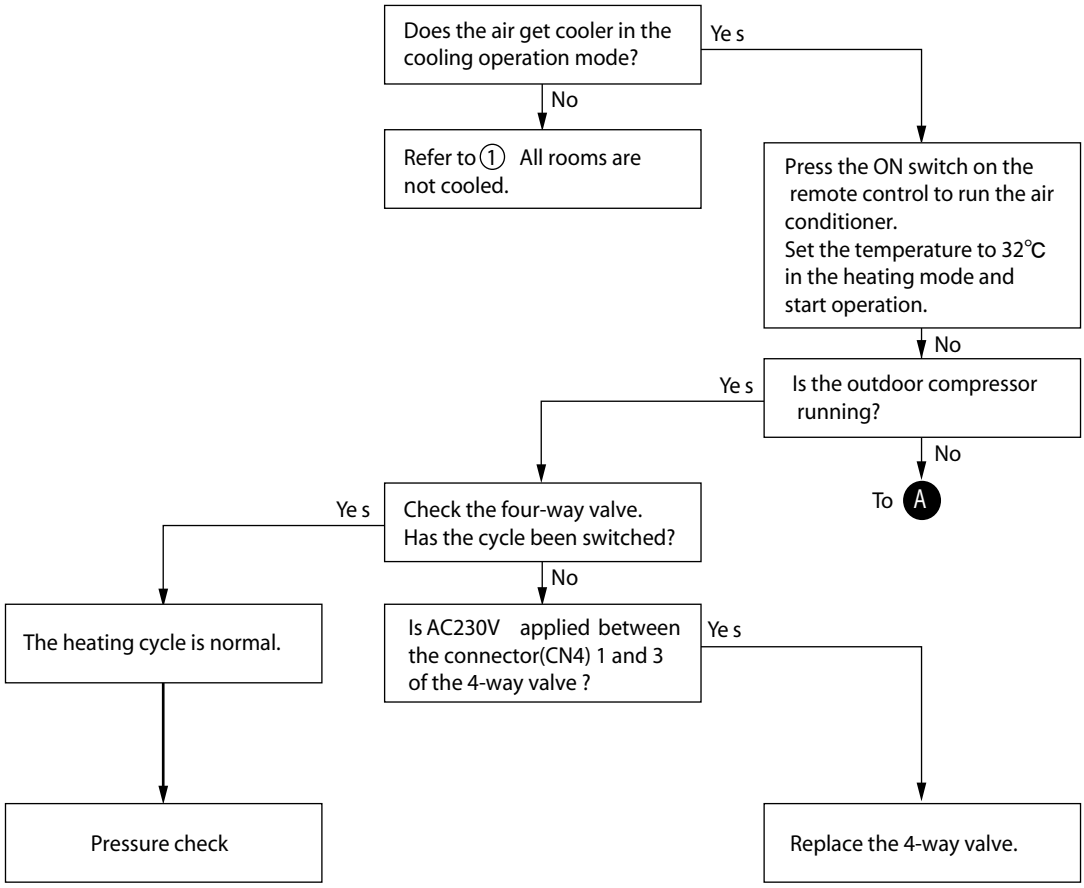

Are the timer lamps of the indoor units in all rooms flashing ?
Yes
No
Press the OPERATION button to start operating the air-conditioner. (One-room operation ON) (Set the cooling mode to 18 ℃)
Is the compressor of the outdoor unit operating ?
Yes
No
The cooling cycle is abnormal.
Check the pressure.
Are the timer lamps of the indoor units in all rooms flashing ?
Yes
No
Check that the power between the terminal board " N " and " L " of the indoor unit is AC 230V, 50Hz.
Repair the wiring between the units.
Check the failure symptom with the failure diagnosis mode.
(Check the failure with the outdoor unit.)
TO A


A
Open circuit of the outdoor thermistor
Overheat of the compressor
AC overcurrent
Rotation error of the compressor
Power module PWB (IPM) abnormality
Abnormal AC current
• Open circuit of serial s ignal line
• Short circuit of serial s ignal line
Power factor module (AF1) error
Is the resistance value of the ther - mistor for the com- pressor (TH1), heat ex-changer (TH2) or outdoor temper- ature (TH3) or suc- tion (TH4, TH6-9) correct?
Yes
No
Replace the thermistor.
Is the outdoor fan motor operating ?
Yes
No
The cycle is abnormal .
Inspect the compres - sor, heat exchanger and piping.
Is CN3 connected ?
No
Yes
Connect CN3
Check the FUSE 5
Is the resistance value between ⑤ and ⑧ of fan motor 0?
Yes
No
Replace the fan motor.
Check the voltage (15V).
Yes
No
Is CN2 connected ?
No
Connect CN2
Check the voltage (15V).
No
Yes
Is each of the resistance values among the termi - nals of the IPM PWB 0 ?
P - U, N - U
P - V, N - V
P - W, N - W
No
Yes
Replace the IPM PWB
The compressor is abnormal.
Replace the Compressor.
Is the IPM PWB in a state of floating from the heat sink ?
Yes
No
Fix the IPM PWB with screws securely.
Is each of the resist- ance values among the terminals of the IPM PWB 0 ?
P - U, N - U
P - V, N - V
P - W, N - W
Yes
No
Replace the IPM PWB.
Is the winding of the current transformer (CT1) broken ?
Is the resistance value of the winding in the current trans - former (CT1) ? (720)
No
Yes
Replace the current transformer
Are 4 LED switched off ?
Yes
Is CN6 connected ?
No
Yes
Connect CN6.
Check the voltage (5V).
Is the Power factor module in a state of flaoting from the heatsink?
Yes
No
Fix the Power factor module with screws secuerly
Is the resistance value among the terminal of the Power fac - tor module (AF1) 0 ?
Yes
No
Replace the Power factor module (AF1)
Replace the outdoor control PWB.

2. When one room is not cooled (other rooms are cooled)


Is the timer lamp of the indoor unit in the room not cooled flashing ?
Yes
No
Press the OPERATION button to start operating the air-conditioner. (Set the cooling mode to 18 °C)
Is the timer lamp of the indoor unit in the room not cooled flashing ?
Yes
No
Check the failure symptom with the failure diagnosis mode.
• Short circuit of the thermistor error
• Open circuit of the thermistor error
Is the resistance value of the thermistor for UNIT A (TH6), UNIT B (TH7), UNIT C (TH8) or UNIT D (TH9)
Yes
No
Replace the thermistor.
Replace the outdoor control PWB or the expansion valve (UNIT A) or the expansion valve (UNIT B) or the expansion valve (UNIT C) or the expansion valve (UNIT D)
Check that the power between the terminal board "N" and "1" of the indoor unit is AC 230V.
Yes
No
Replace the indoor control PWB.
Repair the wiring between the units.
Abnormal fan motor of indoor unit
Is the resistance value of the winding in the fan motor ?
Yes
No
The fuse is blown.
Replace the indoor fan motor.
• Open circuit of serial signal line
• Short circuit of serial signal line
Is the wiring between the units connected by mistake or broken ?
Yes
No
Repair the wiring between the units.
Replace the indoor control PWB.

③ When all rooms are not heated


Does the air get cooler in the cooling operation mode?
Ye s
No
Refer to ① All rooms are not cooled.
Press the ON switch on the remote control to run the air conditioner.
Set the temperature to 32℃ in the heating mode and start operation.
No
Ye s
Is the outdoor compressor running?
No
To A
Ye s
Check the four-way valve. Has the cycle been switched?
No
The heating cycle is normal.
Is AC230V applied between the connector(CN4) 1 and 3 of the 4-way valve ?
Ye s
Pressure check
Replace the 4-way valve.

CHAPTER 4. REFRIGERATION CYCLE

[1] REFRIGERATION SYCLE

1. class indoor unit is connected UNITA

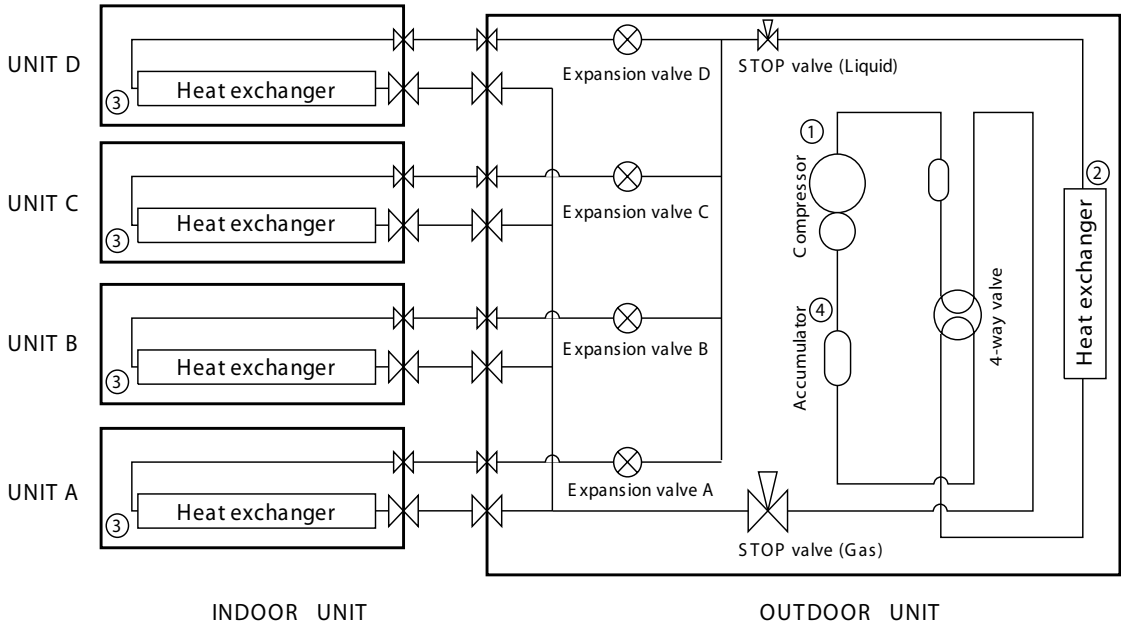


Figure Refrigeration Cycle

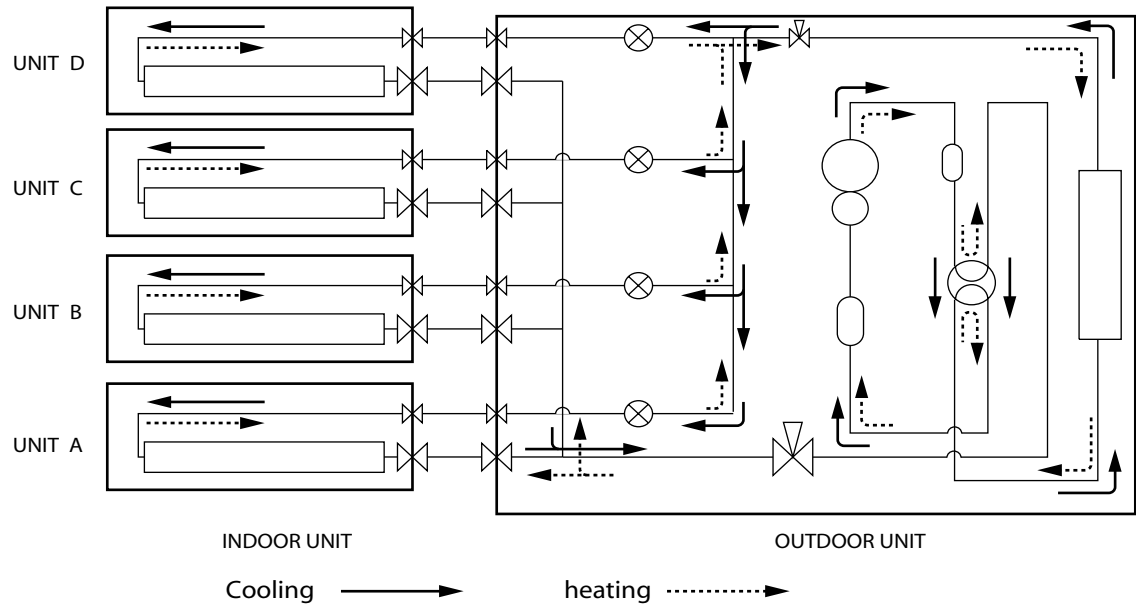


Figure Flow of Refrigerant

2. Cycle temperature and pressurre in stop valve (AEXM24HR)

Running unit	no opration mode	Cool(MAX)	Cool(Test run)	Heat(MAX)	Heat(Test run)
07 & 07 & 07 & 07 (4 units)	1	88	71	74	48
	2	43	40	14	5
	3	13	16	31	24
	4	14	17	0	3
	stop valve (gas saide)	1.12MPa(abs)	1.23MPa(abs)	2.33MPa(abs)	1.80MPa(abs)
	Frequency	100Hz	55Hz	110Hz	50Hz
12 (1 unit)	1	83	69	75	55
	2	37	36	19	8
	3	10	12	38	23
	4	11	17	1	7
	stop valve pressure Frequency	0.90MPa(abs)	1.08MPa(abs)	3.54MPa(abs)	2.17MPa(abs)
	Frequency	60Hz	30Hz	85Hz	40Hz
09 (1 unit)	1	65	57	83	55
	2	37	37	18	7
	3	11	14	40	24
	4	6	12	3	6
	stop valve pressure Frequency	0.96MPa(abs)	1.14MPa(abs)	3.50MPa(abs)	2.10MPa(abs)
	Frequency	45Hz	25Hz	75Hz	30Hz
07 (1 unit)	1	71	63	72	48
	2	31	35	13	7
	3	11	14	32	25
	4	16	21	4	7
	stop valve pressure Frequency	1.03MPa(abs)	1.18.MPa(abs)	3.07MPa(abs)	1.93MPa(abs)
	Frequency	35Hz	20Hz	60Hz	25Hz

Standard conditions

	indoor saide		Outdoor saide	
	Dry-bulbtemp(°c)	Relativehumid-ity(%)	Dry-bulbtemp(°c)	Relativehumid-ity(%)
Çooling	27	47	35	40
Heeting	20	–	7	87

3. PERFORMANCE CURVES

NOTE: Total cooling capacity and total input with 4 units running.

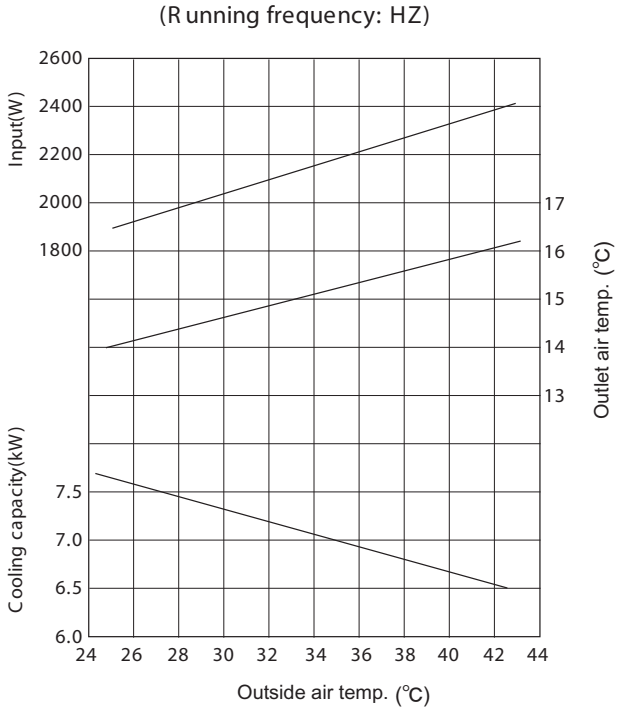


Fig. At Cooling for AY-XPM7FR (for AE-XM24HR)

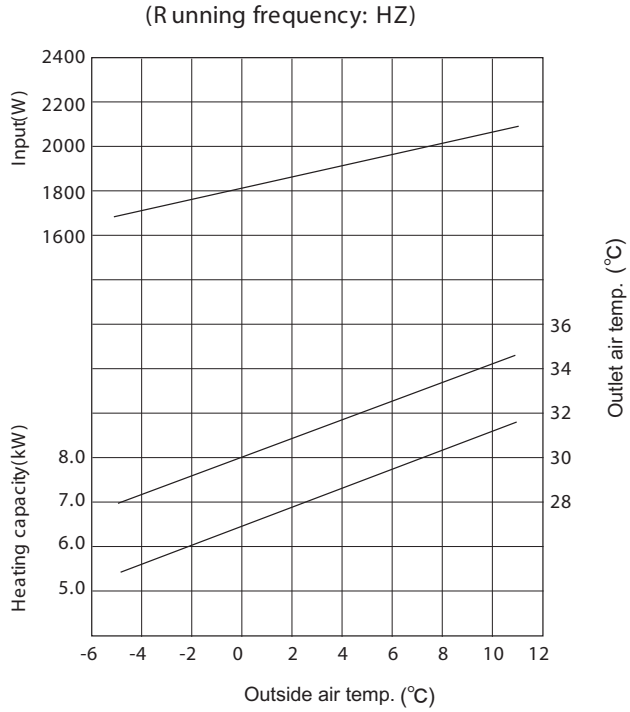


Fig. At Heating for AY-XPM7FR (for AE-XM24HR)

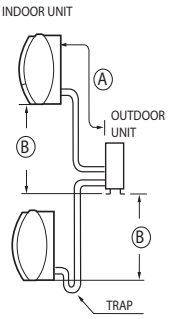
[2] PERFORMANCE CURVES

1. Piping

Max. piping length (A)	20m
Max. piping length (A)	3m
Max. total piping length of all unit	50m
Max.level difference (B)	10m

a. If total piping iength exceeds 40m, add20g of refrigerant per 1m.

b. When the outdoor unit is placed at a higher level than the indoor units, provide a trap near the hose' s lead-in port.



2. Air-removing

Use an adapter for preventing vacuum pump oil from flowing back to the gauge manifold hose. ON/OFF operation of the vacuum pump should be made by the adapter switch.

(1) Remove both valve shaft caps of the stop valves.

(2) Remove the service port cap of the stop valve (gas side).

(3) Connect the gauge manifold hose to the service port and the vacuum pump. Be sure that the hose end to be connected to the service port has a valve core pusher.

(4) Open the gauge manifold valve and operate the vacuum pump for 10-15 minutes. Make sure the com pound gauge reads -0.1MPa (-76cmHg).

(5) Close the gauge manifold valve.

(6) Turn off the vacuum pump.

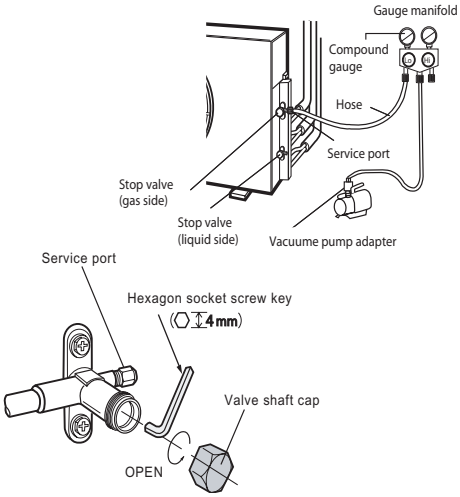
(7) Fully open the stop valve (liquid side) with hexagon socket screw key. Turn all the way up to contact.

(8) Fully open the stop valve (gas side) with hexagon socket screw key. Turn all the way up to contact.

9) Disconnect the gauge manifold hose from the service port.

(10) Replace the service port cap and both valve shaft caps tightly. Turn until thetorque suddenly increases. Now tighten a 1/6-turn more.

NOTE: *Use a gauge manifold and hoses exclusive for R410A.
*After air removal,check the tubeconnections for gas.. leak using a leakage detector or soapy water.Regarding leakage detector,use high-sensitivity type designed specially for R410A.



Pump down

(Pump down is adopted in the case of unit removal for re installation, abandonment, repair etc.)

Pump down is to collect the refrigerant into the outdoor unit by control of the stop valves and the compressor.

(1) Turn the circuit breaker on.

(2) Check that all LED (1.2.3.4)
on the display board unit are flashing synchronously in a slow (one flash per second) cycle.

(3) Stop the air conditioner operation.

(4) Remove both valve shaft caps of the stop valves.

(5) Press the PUMP DOWN SWITCH (SW1) on the display board unit for 5 seconds or more. The indoor/outdoor unit will start operation in the pump down mode.
(the OPERATION lamp on the indoor unit will flash and three BEEP will be emitted.)

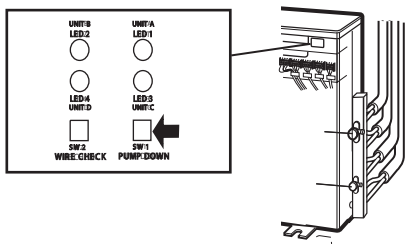
(6) After 5 ~ 10 minutes, fully close the stop valve (liquid side) by turning the hexagon socket screw key clockwise.

(7) After2~3minutes, immediately close the stop valve (gas side) fully.

(8) Press the PUMP DOWN SWITCH (SW1) on the display board unit for 5 seconds or more.
The operation of indoor/outdoor unit will stop.

(9)Replace the service port cap and both valve shaft caps tightly.

NOTE: *Wait more than 90 seconds after finishing pumpdown, and turn off the circuit breaker off.

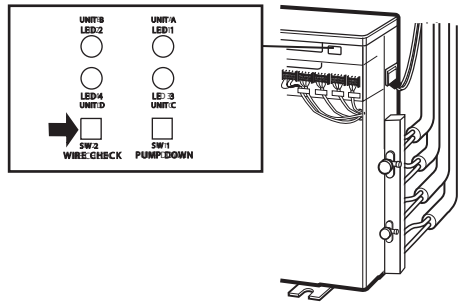


MISWIRING CHECK

Miswiring check must be performed after installation, reinstallation and service.

This multi-type air conditioner is designed with a WIRE CHECK SWITCH on the outdoor unit, and miswiring of unit-to-unit wiring will be self-corrected by microcomputer.

Miswiring check may not be performed when the outdoor temperature is below 5°C .



(1) Complete the unit-to-unit wiring/piping and perform the air removing of the pipes. Turn the electrical circuit breaker ON. Before turning the circuit breaker ON, make sure no one is working on the indoor units installation. Electrical shock or injury may occur.

(2) Check that all LED on the display board unit are flashing synchronously in a slow (one flash per second) cycle. If either one or more of all LED is/are kept lighted on, check and correct the wrong wirings among N, 1, 2, terminals so that all LED will flash slowly, showing normal condition.

(3) Press the WIRE CHECK SWITCH (SW2) on the display board unit for 5 seconds or more. The flashing of all LED will change. Miswiring (mispiping) check will start and the indoor and outdoor units will start operating. (The red operation lamp on the indoor unit will flash, and three BEEP will be emitted.) Miswiring of unit-to-unit wiring will be self-corrected.

(4) Wrong piping works cannot be corrected, and will be detected as an error. When an error is detected during checking, all LED will show triple flash for eight times. The indoor and outdoor operation will stop. Turn the circuit breaker OFF and check and correct the miswiring (mispiping)

*. After correction, return to step 1 and repeat the miswiring (mispiping) check again. If error is still detected,or other types of LED signal should be indicated, please contact a service technician. (Refer to wiring diagram attached inside the outdoor unit cabinet for self diagnosis signal.)

(5) All LED (LED1, 2, 3, 4) will flash synchronously in a slow (one flash per second) cycle when miswiring (mispiping) check is completed with no error detection (3~6 minutes), and the operation of indoor and outdoor units will stop .(The red operation lamp flashing on the indoor unit will go off.)

(6) Place the control box cover back in the reverse order.

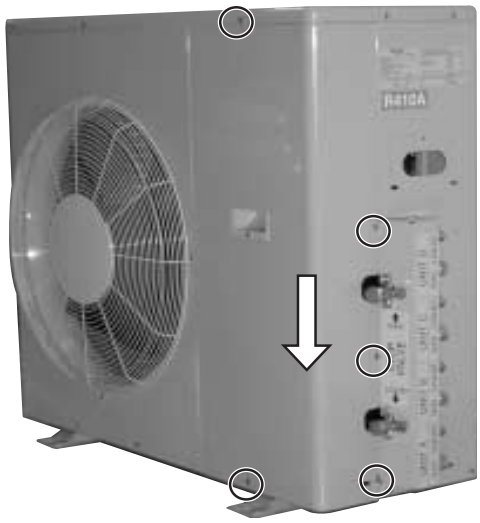
*Correction points on error detection

1. Are all piping the total multi air conditioner system connected?
2. Are the stop valves open?

CHAPTER 5. DISASSEMBLING PROCEDURE

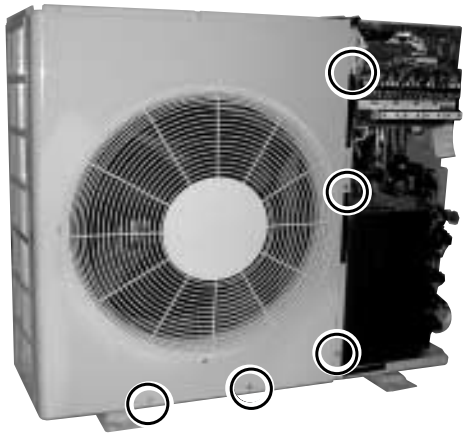
[1] OUTDOOR UNIT

1) Remove the 5 screws fixing the front panel R and slide the front panel R down.

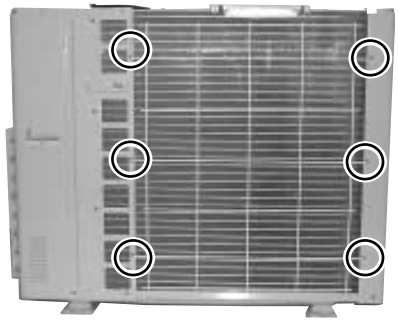


2) Remove the 10 screws fixing the top cover.

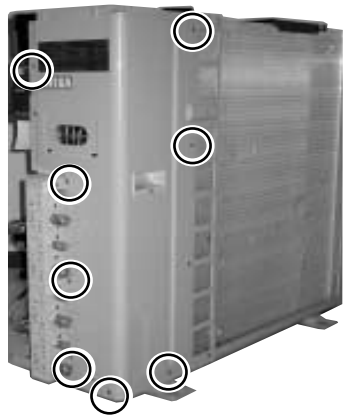
3) Remove the 6 screws fixing thefront panel L.



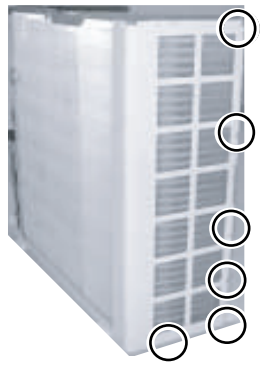
4) Remove the 6 screws fixing the rear guard.



5) Remove the 11 screws fixing the side cover R.



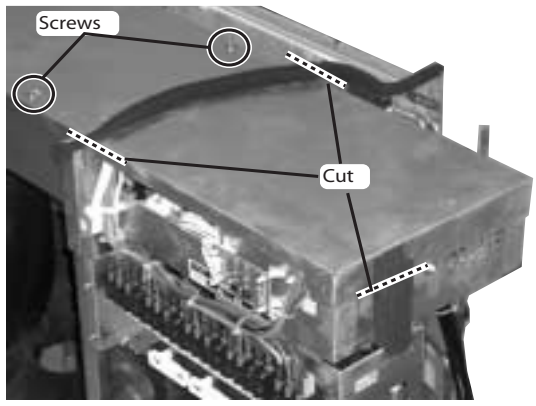
6) Remove the 6 screws fixing the side cabinet L.



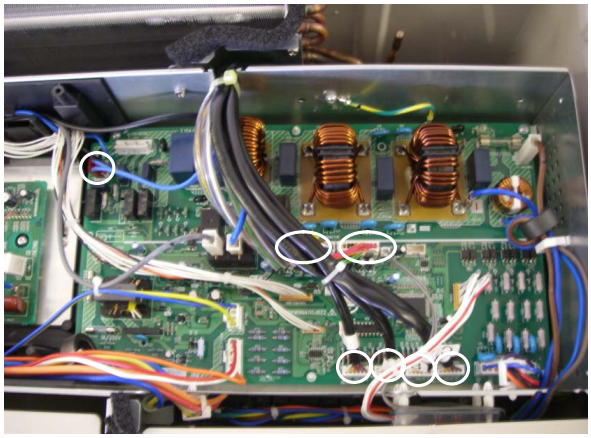
7) Cut the insulators.

8) Remove the 2 screws fixing the control box cover.

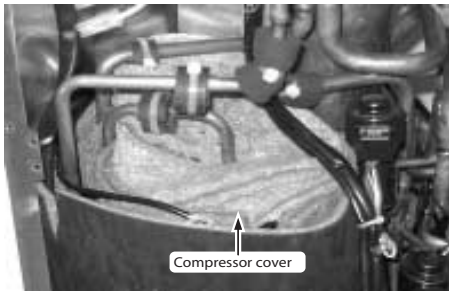
Caution: Discharge electrytic capacitor before touching this capacitor or other components or wirings.



9) Disconnect the 7 connectors.
Fan motor / Reverse valve
Thermistor/ Expansion valve

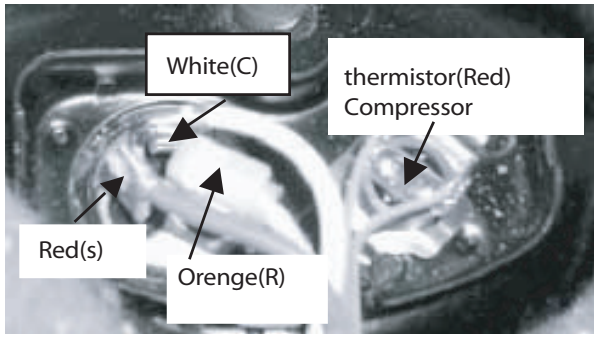


10)Remove the compressor cover.

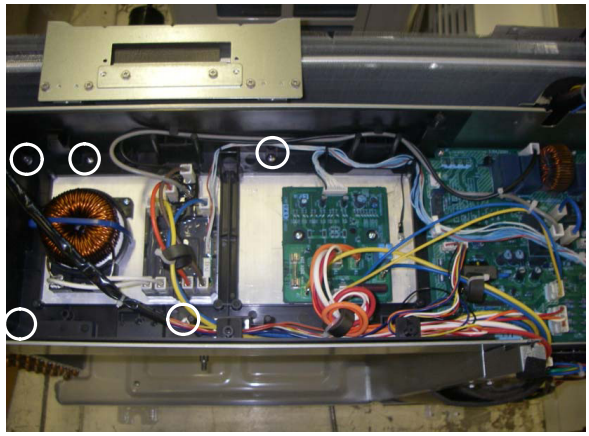


11)Remove the terminal cover and disconnect 3 terminals.

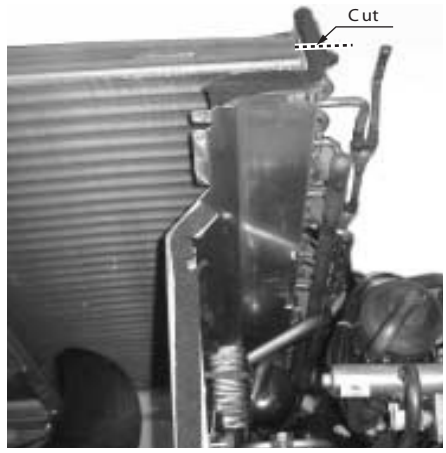
note: Caution to the connectors‘ position when reinstalling.



12)Remove the 5 screws fixing the controlbox assembly.

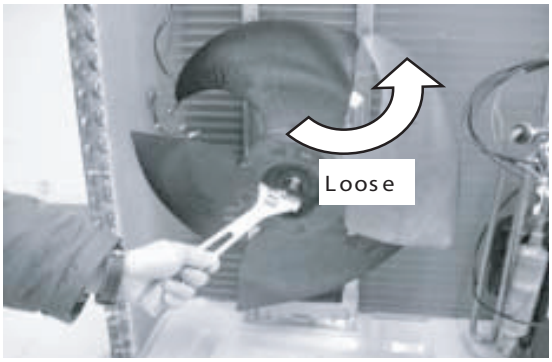


13).Cut the2 insulators.

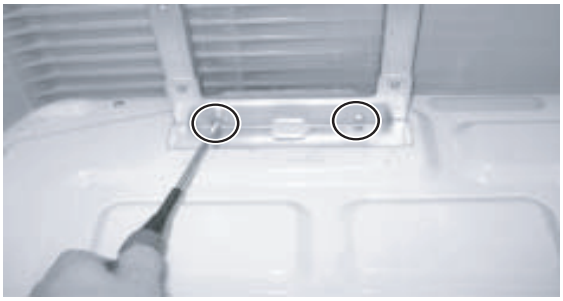


14)Remove the 3 screws fixing the bulkhead.

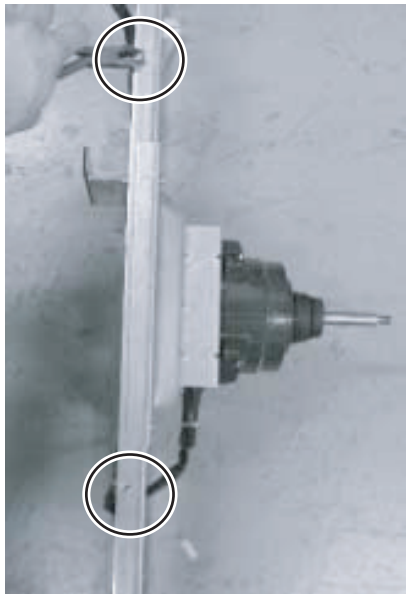
15)Remove the 1 nut fixing the propeller fan.



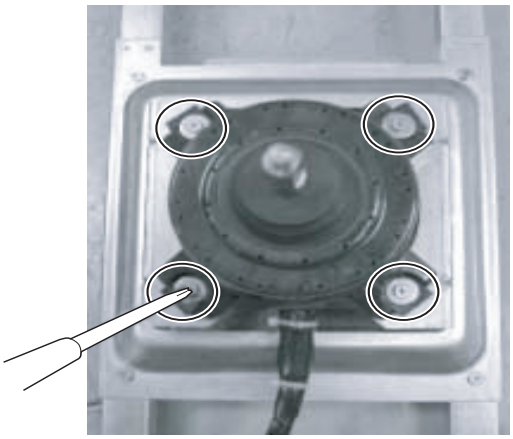
16)remove the 2 screws fixing the motor angle.



17)Cut the fixing bands.

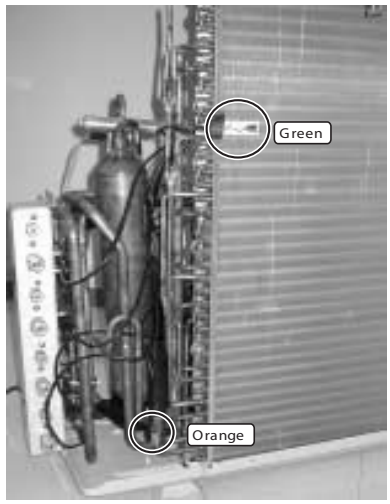


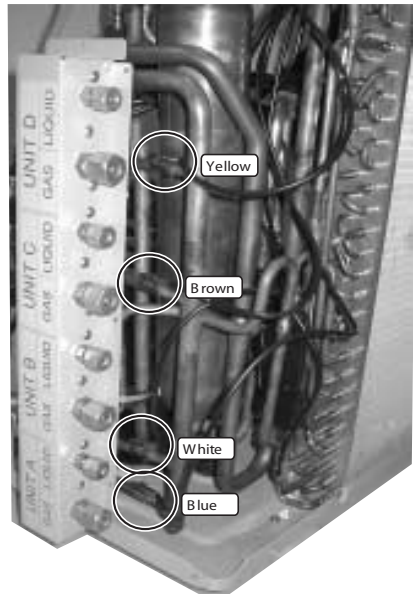
18)Remove the 4 screws fixing the fan motor.



19)Position of the thermistors

Note :Caution to the position when reinstalling.



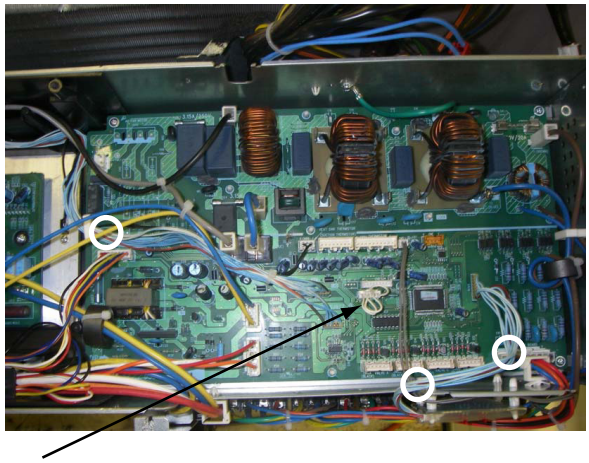


20)How to disassemble the control box assembly

1.Cut the wire fixing band.(3 points)

2. Remove the 4 screws fixing the PWB.

3. Unlock the spacer's lock.



Instal this SHORT-CIRCUIT CONNECTOR
in a new CONTROL PWB at CONTROL PWB exchange.

Mounting position of thermistors and expansion valves

Mounting position of thermistors and expansion valves are shown below.

Thermistor

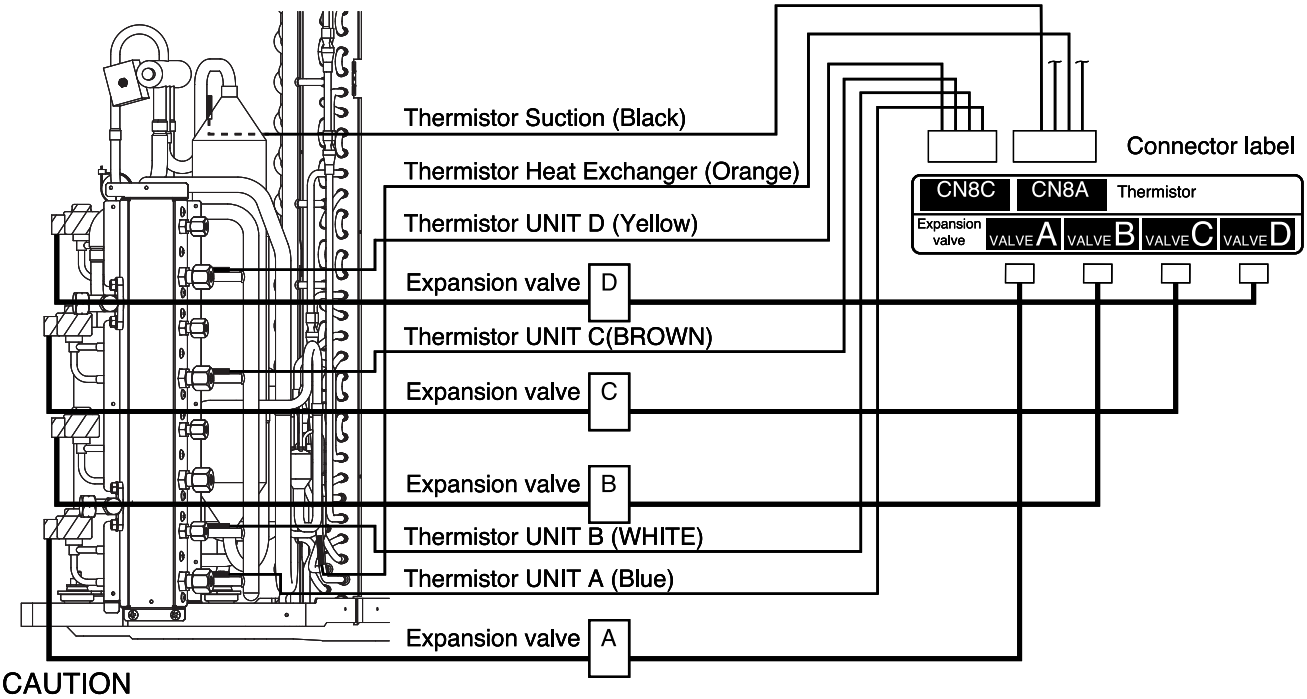
Check the cord color of thermistor before mounting.

Thermistor Suction, UNIT A, UNIT B, UNIT C,UNIT D are mounted on GAS side pipes.

Thermistor Heat exchanger is mounted on LIQUID side pipe.

Expansion valve

Check the labels before connecting to the Control Board Unit.



CAUTION

Mismounting and misconnecting will cause error or failure.

D234

SHARP PARTS GUIDE

MALTI SPLIT TYPE
ROOM AIR CONDITIONERS

OUTDOOR UNIT

MODELS **AE-XM24HR**

CONTENTS

[1] CONTROL BOX PARTS

[2] CABINET AND PARTS

[3] CYCLE PARTS

[4] OTHER PARTS

[5] PACKING PARTS

[6] ACCESSORY PARTS

■ INDEX

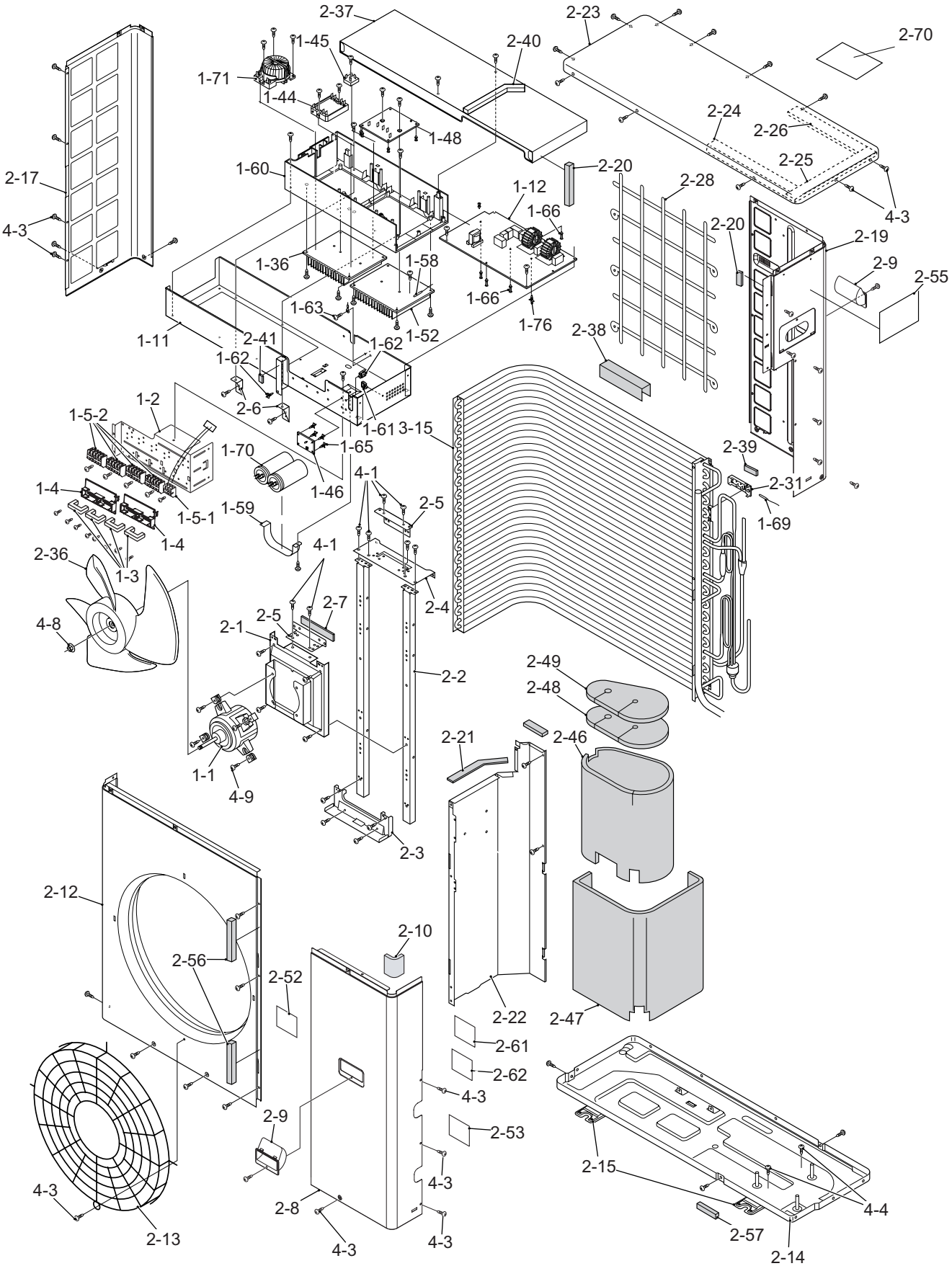
Parts marked with "⚠" are important for maintaining the safety of the set. Be sure to replace these parts with specified ones for maintaining the safety and performance of the set.

SHARP CORPORATION

This document has been published to be used for after sales service only.
The contents are subject to change without notice.

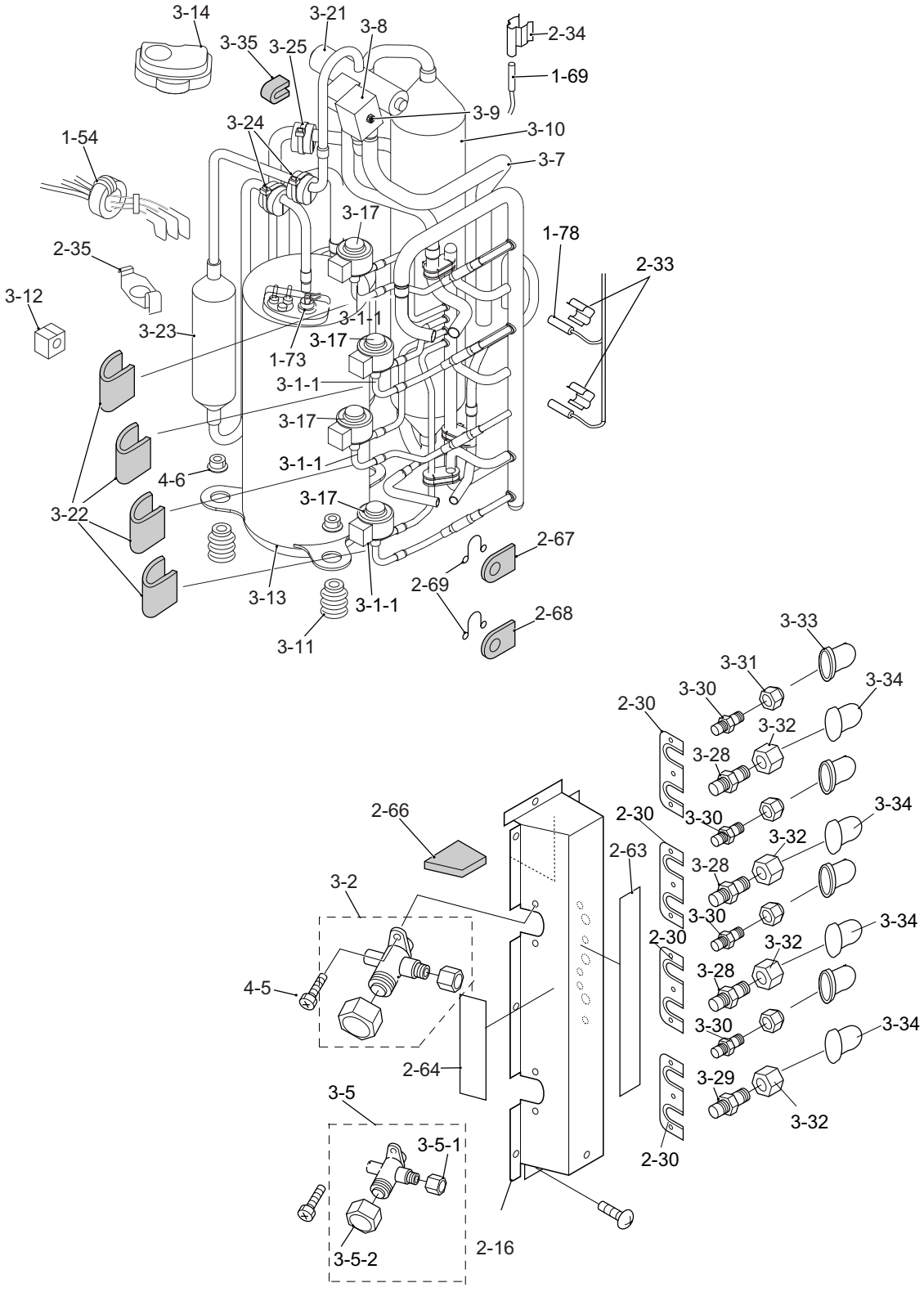
NO.	PARTS CODE	PRICE RANK	N E W MARK	P A R T RANK	DESCRIPTION
[1] CONTROL BOX PARTS					
1-6	QW-VZF873JBZZ	AQ			LEAD WIRE (TB-CN6)
1-7	QW-VZF814JBZZ	AF			LEAD WIRE (TBN-TBN)
1-8	QW-VZF815JBZZ	AF			LEAD WIRE (TB1-TB1)
1-9	QW-VZF816JBZZ	AF			LEAD WIRE (TBE-TBE)
1-10-1	QW-VZF817JBZZ	AH			LEAD WIRE (TBN-L3-1)
1-10-2	QW-VZF818JBZZ	AH			LEAD WIRE (TBL-T1)
1-10-3	QW-VZF819JBZZ	AF			LEAD WIRE (TB1E-BOX)
1-10-4	RFiL-A064JBE0	AF			FERRITE CORE
1-13	RH-VXA002JBZZ	AF			VARISTOR
1-14	QFS-GA065JBZZ	BA			FUSE (20A 250V)
1-15	QFS-GA062JBZZ	AF			FUSE (3.15A 250V)
1-16	QFS-GA063JBZZ	AE			FUSE (2A 250V)
1-17	QFS-GA064JBZZ	AF			FUSE (1A 250V)
1-18	QSPGCA006JBZZ	AH			SURGE ABSORBER
1-22	FW-VZA073JBKZ	AV			LEAD WIRE (DB-AF1)
1-29	RRLYDA008JBZZ	AH			RELAY
1-30	RRLYDA012JBZZ	AR			RELAY
1-37	QW-VZF823JBZZ	AF			LEAD WIRE (AF1-L2-COIL)
1-38	QW-VZF824JBZZ	AF			LEAD WIRE (AF1-L1-COIL)
1-41	QW-VZF827JBZZ	AL			LEAD WIRE (MRY1-DB1AC1)
1-42	QW-VZF828JBZZ	AL			LEAD WIRE (T6-DB1AC2)
1-53	PSPA-A150JBZZ	AF			PWB SPACER
1-55	QW-VZF573JBZZ	AH			LEAD WIRE (DC VOLTAGE)
1-56	QW-VZF821JBZZ	AH			LEAD WIRE (C10+ - TP)
1-57	QW-VZF822JBZZ	AH			LEAD WIRE (C10- - TN)
1-64-1	PSHE-A218JBEZ	AP			PROTECT SHEET
1-64-2	PSHE-A273JBEZ	AF			PROTECT SHEET
1-74	RTRN-A256JBE0	AG			TRANSFORMER

[2] CABINET AND PARTS



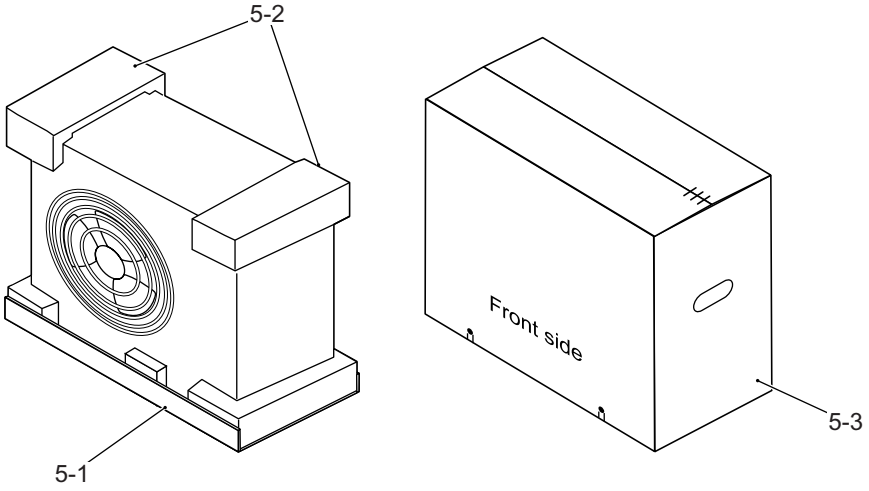
NO.	PARTS CODE	PRICE RANK	NEW MARK	PART RANK	DESCRIPTION
[2] CABINET AND PARTS					
1-1	CMOTLB051JBEZ	BX			FAN MOTOR
1-2	LANG-A540JBWZ	AU			TERMINAL BOARD ANGLE
1-3	LHLD-A539JBFA	AE			CORD HOLDER
1-4	LHLD-A544JBFA	AG			CORD CLAMP HOLDER
1-5-1	QTANZA044JBZZ	AU			TERMINAL BOARD
1-5-2	QTANZA021JBZZ	AN			TERMINAL BOARD
1-11	DBOX-A044JBWZ	AT			CONTROL BOX ASS'Y
1-12	DSGY-C285JBKZ	CB			CONTROL BOARD UNIT
1-36	PRDAFA207JBEZ	BC			HAET SINK
1-44	RH-TXA008JBZZ	BR			ACTIVE FILTER (AF1)
1-45	VHDD25VB60+-1	AN			DIODE BRIDGE
1-46	DSGY-C167JBKZ	AZ			DISPLAY BOARD UNIT
1-48	DSGY-C010JBKZ	BW			IPM30A BOARD
1-52	PRDAFA206JBEZ	BA			HEAT SINK
1-58	RHOG-A169JBE0	AK			PROTECTOR
1-59	LBNDKA113JBWZ	AS			CAPACITOR CLAMP
1-60	LHLD-A656JBFZ	AQ			HEAT SINK HOLDER
1-61	LHLDWA039JBEZ	AC			WIRE H0LDER
1-62	LHLDWA040JBEZ	AC			WIRE H0LDER
1-63	LX-BZA075JBE0	AA			SPECIAL SCREW
1-65	PSPA-A146JBE0	AC			SPACER
1-66	PSPA-A173JBEZ	AE			PWB SPACER
1-69	RH-HXA081JBZZ	BA			THERMISTOR ASS'Y
1-70	RC-AZA046JBE0	BE			ELECTROLYTIC CAP.
1-71	RTRN-A300JBZZ	BK			ACTIVE COIL
1-76	PSPA-A082JBE0	AB			SPACER
2-1	LANGKA164JBPZ	AQ			MOTOR BASE
2-2	LANGKA165JBPZ	AN			MOTOR ANGLE
2-3	LANGKA166JBPZ	AQ			MOTOR ANGLE B
2-4	LANGKA163JBPZ	AX			MOTOR ANGLE T
2-5	LSUB-A029JBPZ	AE			MOTOR ANGLE SUB A
2-6	LSUB-A030JBPZ	AE			MOTOR ANGLE SUB B
2-7	PSEL-C642JBEZ	AA			M.ANG SUB A SEAL
2-8	GCAB-A303JBTA	BE			FRONT PANEL R
2-9	JHNDPA016JBFA	AE			HANDLE
2-10	PSEL-C637JBEZ	AD			FRONT PANEL SEAL A
2-12	GCAB-A247JBTB	BE			FRONT PANEL L
2-13	GGADFA028JBTA	AZ			FAN GUARD
2-14	CCHS-A862JBKZ	BK			BASE PAN ASS'Y
2-15	GLEGMA043JBTB	AX			BASE STAND
2-17	GPLTMA062JBTB	AX			SIDE CABINET L
2-19	GPLTMA066JBTA	BC			SIDE COVER R
2-20	PSEL-C641JBEZ	AD			SIDE COVER R SEAL
2-21	PSEL-C597JBEZ	AC			BULKHEAD INSULATOR
2-22	PSKR-A327JBWZ	BA			BULKHEAD
2-23	GCAB-A248JBTB	BB			TOP COVER
2-24	PSEL-C598JBEZ	AK			TOP COVER SEAL A
2-25	PSEL-C640JBEZ	AG			TOP COVER SEAL B
2-26	PSEL-C702JBEZ	AE			TOP COVER SEAL C
2-28	GGADRA001JBTA	AV			REAR GUARD
2-31	LHLD-A574JBFA	AE			THERMISTOR HOLDER
2-36	NFANPA108JBFA	BA			PROPELLER FAN
2-37	PCOV-A940JBWZ	AP			CONTROL BOX COVER
2-38	PSEL-C282JBEZ	AD			CUSHION
2-39	PSEL-C373JBEZ	AC			SEAL
2-40	PSEL-C634JBEZ	AE			PANEL SEAL A
2-41	PSEL-C635JBEZ	AD			PANEL SEAL B
2-46	PSPF-A908JBEZ	AT			COMPRESSOR COVER A
2-47	PSPF-A898JBEZ	AR			COMPRESSOR COVER B
2-48	PSPF-A910JBEZ	AF			COMPRESSOR COVER C
2-49	PSPF-A911JBEZ	AG			COMPRESSOR COVER D
2-52	TLABBA146JBRA	AP			BADGE
2-53	TLABCC373JBRZ	AF			WIRING DIAGRAM
2-55	TSPC-F845JBRZ	AL			NAME LABEL
2-56	PSEL-C760JBEZ	AB			FR. PANEL L SEAL A
2-57	PSEL-C761JBEZ	AB			BASE PAN SEAL A
2-61	TLAB-D234JBRZ	AR			SERVICE LABEL
2-62	TLAB-C773JBRZ	AN			LABEL
2-70	TLAB-D257JBEZ	AF			EU ENERGY LABEL
3-15	PCON-A553JBPZ	CC			CONDENSER
4-1	LX-BZA140JBE0	AB			SPECIAL SCREW
4-3	LX-BZA364JBEZ	AC			SPECIAL SCREW
4-4	LX-BZA380JBEZ	AK			SPECIAL SCREW
4-8	LX-NZA319JBEZ	AE			SPECIAL NUT
4-9	LX-BZA363JBEZ	AE			SPECIAL SCREW

[3] CYCLE PARTS



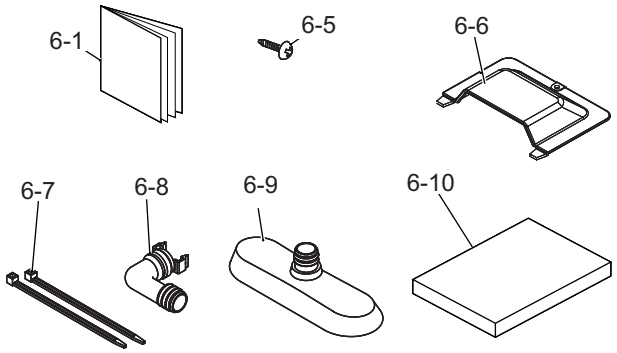
NO.	PARTS CODE	PRICE RANK	NEW MARK	PART RANK	DESCRIPTION
[3] CYCLE PARTS					
1-54	QW-iZA112JBZZ	AZ			COMPRESSOR CORD
1-69	RH-HXA081JBZZ	BA			THERMISTOR ASS'Y
1-73	RTHM-A022JBE0	AN			THERMISTOR
1-78	RH-HXA092JBZZ	BC			THERMISTOR
2-16	PDAi-A177JBTB	BB			FLARE COUPLING BASE
2-30	LSUB-A020JBWZ	AE			FLARE CUP.SUB-S
2-33	MSPR-A026JBE0	AB			THERMISTOR SPRING
2-34	MSPR-A036JBE0	AB			THERMISTOR SPRING
2-35	MSPR-A046JBE0	AC			PROTECTOR SPRING
2-63	TLAB-C770JBRA	AR			UNIT LABEL
2-64	TLAB-B709JBRA	AH			LABEL
2-66	PSEL-C006JBEZ	AC			INSULATOR
2-67	PGUM-A119JBEZ	AG			VALVE RUBBER
2-68	PGUM-A120JBEZ	AG			VALVE RUBBER
2-69	MSPR-A129JBE0	AD			CYCLE SPRING
3-1-1	PVLVRA040JBEZ	BM			EXPANSION VALVE
3-2	DVLV-A668JBKZ	AZ			3WAY VALVE UNIT
3-5	DVLV-A669JBKZ	AW			3WAY VALVE UNIT
3-5-1	LX-NZA228JBEZ	AD			SERVICE NUT
3-5-2	LX-NZA227JBEZ	AF			BONNET
3-7	DVLV-A847JBKZ	BD			REVERSE VALVE ASS'Y
3-8	CCiL-A112JBEZ	AX			COIL
3-9	LX-BZA268JBEZ	AB			SPECIAL SCREW
3-10	PACU-A043JBEZ	BW			ACCUMULATOR
3-11	GLEG-A029JBE0	AK			CPMPRESSOR CUSHION
3-12	LBSHCA005JBE0	AD			TERMINAL BUSHING
3-13	PCMPRA563JBEZ	CT			COMPRESSOR
3-14	PCOV-0562JBE0	AG			TERMINAL COVER
3-17	RMOTSA031JBZZ	BC			COIL
3-21	PVLVXA061JBEZ	BD			REVERSE VALVE
3-22	PGUMSA319JBEZ	AF			DAMPER RUBBER
3-23	PMUF-A081JBEZ	AY			MUFFLER
3-24	PGUM-A121JBEZ	AG			RUBBER
3-25	PGUM-A122JBEZ	AG			RUBBER
3-28	DVLV-A841JBKZ	AZ			FLARE UNION UNIT 3S
3-29	DVLV-A842JBKZ	AZ			FLARE UNION UNIT 3S
3-30	DVLV-A843JBKZ	AZ			FLARE UNION UNIT 2S
3-31	LX-NZA250JBEZ	AE			FLARE NUT
3-32	LX-NZA251JBEZ	AG			FLARE NUT
3-33	PCAP-A083JBEZ	AC			NUT BONNET
3-34	PCAP-A084JBEZ	AC			NUT BONNET
3-35	PTUB-A196JBEZ	AK			PIPE INSULATOR
4-5	LX-BZA078JBE0	AB			SPECIAL SCREW
4-6	LX-NZA313JBEZ	AE			SPECIAL NUT
[4] OTHER PARTS					
1-86	TLAB-D247JBRZ	AF			LABEL
1-90	TLAB-D231JBRZ	AF			LABEL
3-27	FCMPRA240JBKZ	CU			COMPRESSOR ASS'Y

[5] PACKING PARTS



NO.	PARTS CODE	PRICE RANK	NEW MARK	PART RANK	DESCRIPTION
[5] PACKING PARTS					
5-1	CPADBA072JBKZ	AR			BOTTOM PAD ASS'Y
5-2	CPADBA073JBKZ	AH			PACKING PAD ASS'Y
5-3	SPAKCC381JBEZ	BE			PACKING CASE

[6] ACCESSORY PARTS



NO.	PARTS CODE	PRICE RANK	NEW MARK	PART RANK	DESCRIPTION
[6] ACCESSORY PARTS					
6-1	TiNS-B107JBRZ	AC			INSTALLATION MANUAL
6-1	TiNS-B108JBRZ	AH			INSTALLATION MANUAL
6-1	TiNS-B109JBRZ	AH			INSTALLATION MANUAL
6-5	LX-BZA140JBE0	AB			SPECIAL SCREW
6-6	GFTASA002JBFA	AM			CABLE COVER
6-7	LBND-A046JBE0	AE			WIRE FIXING BAND
6-8	LPFT-A134JBFZ	AF			DRAIN JOINT
6-9	LPFT-A135JBFZ	AH			DRAIN TRAY
6-10	PTUB-A218JBEZ	AB			TUBE INSULATOR

■INDEX

PARTS CODE	No.	PRICE RANK	NEW MARK	PART RANK
【 C 】				
CCHS-A862JBKZ	2-2-14	BK		
CCiL-A112JBEZ	3-3-8	AX		
CMOTLB051JBEZ	2-1-1	BX		
CPADBA072JBKZ	5-5-1	AR		
CPADBA073JBKZ	5-5-2	AH		
【 D 】				
DBOX-A044JBWZ	2-1-11	AT		
DSGY-C010JBKZ	2-1-48	BW		
DSGY-C167JBKZ	2-1-46	AZ		
DSGY-C285JBKZ	2-1-12	CB		
DVLV-A668JBKZ	3-3-2	AZ		
DVLV-A669JBKZ	3-3-5	AW		
DVLV-A841JBKZ	3-3-28	AZ		
DVLV-A842JBKZ	3-3-29	AZ		
DVLV-A843JBKZ	3-3-30	AZ		
DVLV-A847JBKZ	3-3-7	BD		
【 F 】				
FCMPRA240JBKZ	4-3-27	CU		
FW-VZA073JBKZ	1-1-22	AV		
【 G 】				
GCAB-A247JBTB	2-2-12	BE		
GCAB-A248JBTB	2-2-23	BB		
GCAB-A303JBTA	2-2-8	BE		
GFTASA002JBFA	6-6-6	AM		
GGADFA028JBTA	2-2-13	AZ		
GGADRA001JBTA	2-2-28	AV		
GLEG-A029JBE0	3-3-11	AK		
GLEGMA043JBTB	2-2-15	AX		
GPLTMA062JBTB	2-2-17	AX		
GPLTMA066JBTA	2-2-19	BC		
【 J 】				
JHNDPA016JBFA	2-2-9	AE		
【 L 】				
LANG-A540JBWZ	2-1-2	AU		
LANGKA163JBPZ	2-2-4	AX		
LANGKA164JBPZ	2-2-1	AQ		
LANGKA165JBPZ	2-2-2	AN		
LANGKA166JBPZ	2-2-3	AQ		
LBND-A046JBE0	6-6-7	AE		
LBNDKA113JBWZ	2-1-59	AS		
LBSHCA005JBE0	3-3-12	AD		
LHLD-A539JBFA	2-1-3	AE		
LHLD-A544JBFA	2-1-4	AG		
LHLD-A574JBFA	2-2-31	AE		
LHLD-A656JBFZ	2-1-60	AQ		
LHLDWA039JBEZ	2-1-61	AC		
LHLDWA040JBEZ	2-1-62	AC		
LPFT-A134JBFZ	6-6-8	AF		
LPFT-A135JBFZ	6-6-9	AH		
LSUB-A020JBWZ	3-2-30	AE		
LSUB-A029JBPZ	2-2-5	AE		
LSUB-A030JBPZ	2-2-6	AE		
LX-BZA075JBE0	2-1-63	AA		
LX-BZA078JBE0	3-4-5	AB		
LX-BZA140JBE0	2-4-1	AB		
〃	6-6-5	AB		
LX-BZA268JBEZ	3-3-9	AB		
LX-BZA363JBEZ	2-4-9	AE		
LX-BZA364JBEZ	2-4-3	AC		
LX-BZA380JBEZ	2-4-4	AK		
LX-NZA227JBEZ	3-3-5-2	AF		
LX-NZA228JBEZ	3-3-5-1	AD		
LX-NZA250JBEZ	3-3-31	AE		
LX-NZA251JBEZ	3-3-32	AG		
LX-NZA313JBEZ	3-4-6	AE		
LX-NZA319JBEZ	2-4-8	AE		
【 M 】				
MSPR-A026JBE0	3-2-33	AB		
MSPR-A036JBE0	3-2-34	AB		
MSPR-A046JBE0	3-2-35	AC		
MSPR-A129JBE0	3-2-69	AD		
【 N 】				
NFANPA108JBFA	2-2-36	BA		
【 P 】				
PACU-A043JBEZ	3-3-10	BW		
PCAP-A083JBEZ	3-3-33	AC		
PCAP-A084JBEZ	3-3-34	AC		
PCMPRA563JBEZ	3-3-13	CT		

PARTS CODE	No.	PRICE RANK	NEW MARK	PART RANK
PCON-A553JBPZ	2-3-15	CC		
PCOV-0562JBE0	3-3-14	AG		
PCOV-A940JBWZ	2-2-37	AP		
PDAi-A177JBTB	3-2-16	BB		
PGUM-A119JBEZ	3-2-67	AG		
PGUM-A120JBEZ	3-2-68	AG		
PGUM-A121JBEZ	3-3-24	AG		
PGUM-A122JBEZ	3-3-25	AG		
PGUMSA319JBEZ	3-3-22	AF		
PMUF-A081JBEZ	3-3-23	AY		
PRDAFA206JBEZ	2-1-52	BA		
PRDAFA207JBEZ	2-1-36	BC		
PSEL-C006JBEZ	3-2-66	AC		
PSEL-C282JBEZ	2-2-38	AD		
PSEL-C373JBEZ	2-2-39	AC		
PSEL-C597JBEZ	2-2-21	AC		
PSEL-C598JBEZ	2-2-24	AK		
PSEL-C634JBEZ	2-2-40	AE		
PSEL-C635JBEZ	2-2-41	AD		
PSEL-C637JBEZ	2-2-10	AD		
PSEL-C640JBEZ	2-2-25	AG		
PSEL-C641JBEZ	2-2-20	AD		
PSEL-C642JBEZ	2-2-7	AA		
PSEL-C702JBEZ	2-2-26	AE		
PSEL-C760JBEZ	2-2-56	AB		
PSEL-C761JBEZ	2-2-57	AB		
PSHE-A218JBEZ	1-1-64-1	AP		
PSHE-A273JBEZ	1-1-64-2	AF		
PSKR-A327JBWZ	2-2-22	BA		
PSPA-A082JBE0	2-1-76	AB		
PSPA-A146JBE0	2-1-65	AC		
PSPA-A150JBZZ	1-1-53	AF		
PSPA-A173JBEZ	2-1-66	AE		
PSPF-A898JBEZ	2-2-47	AR		
PSPF-A908JBEZ	2-2-46	AT		
PSPF-A910JBEZ	2-2-48	AF		
PSPF-A911JBEZ	2-2-49	AG		
PTUB-A196JBEZ	3-3-35	AK		
PTUB-A218JBEZ	6-6-10	AB		
PVLVRA040JBEZ	3-3-1-1	BM		
PVLVXA061JBEZ	3-3-21	BD		
【 Q 】				
QFS-GA062JBZZ	1-1-15	AF		
QFS-GA063JBZZ	1-1-16	AE		
QFS-GA064JBZZ	1-1-17	AF		
QFS-GA065JBZZ	1-1-14	BA		
QSPGCA006JBZZ	1-1-18	AH		
QTANZA021JBZZ	2-1-5-2	AN		
QTANZA044JBZZ	2-1-5-1	AU		
QW-iZA112JBZZ	3-1-54	AZ		
QW-VZF573JBZZ	1-1-55	AH		
QW-VZF814JBZZ	1-1-7	AF		
QW-VZF815JBZZ	1-1-8	AF		
QW-VZF816JBZZ	1-1-9	AF		
QW-VZF817JBZZ	1-1-10-1	AH		
QW-VZF818JBZZ	1-1-10-2	AH		
QW-VZF819JBZZ	1-1-10-3	AF		
QW-VZF821JBZZ	1-1-56	AH		
QW-VZF822JBZZ	1-1-57	AH		
QW-VZF823JBZZ	1-1-37	AF		
QW-VZF824JBZZ	1-1-38	AF		
QW-VZF827JBZZ	1-1-41	AL		
QW-VZF828JBZZ	1-1-42	AL		
QW-VZF873JBZZ	1-1-6	AQ		
【 R 】				
RC-AZA046JBE0	2-1-70	BE		
RFiL-A064JBE0	1-1-10-4	AF		
RH-HXA081JBZZ	2-1-69	BA		
〃	3-1-69	BA		
RH-HXA092JBZZ	3-1-78	BC		
RHOG-A169JBE0	2-1-58	AK		
RH-TXA008JBZZ	2-1-44	BR		
RH-VXA002JBZZ	1-1-13	AF		
RMOTSA031JBZZ	3-3-17	BC		
RRLYDA008JBZZ	1-1-29	AH		
RRLYDA012JBZZ	1-1-30	AR		
RTHM-A022JBE0	3-1-73	AN		
RTRN-A256JBE0	1-1-74	AG		
RTRN-A300JBZZ	2-1-71	BK		

PARTS CODE	No.	PRICE RANK	NEW MARK	PART RANK
【 S 】				
SPAKCC381JBEZ	5-5-3	BE		
【 T 】				
TiNS-B107JBRZ	6-6-1	AC		
TiNS-B108JBRZ	6-6-1	AH		
TiNS-B109JBRZ	6-6-1	AH		
TLAB-B709JBRA	3-2-64	AH		
TLABBA146JBRA	2-2-52	AP		
TLAB-C770JBRA	3-2-63	AR		
TLAB-C773JBRZ	2-2-62	AN		
TLABCC373JBRZ	2-2-53	AF		
TLAB-D231JBRZ	4-1-90	AF		
TLAB-D234JBRZ	2-2-61	AR		
TLAB-D247JBRZ	4-1-86	AF		
TLAB-D257JBEZ	2-2-70	AF		
TSPC-F845JBRZ	2-2-55	AL		
【 V 】				
VHDD25VB60+-1	2-1-45	AN		